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Editorial.

Rural Uplift and District Economic Councils. The Madras Government have recently announced the apportionment to the various districts, of the 15 lakhs allotted by the Government of India for the work of rural construction to be executed during the current year. While doing so, they have rightly stipulated that the villages that are to benefit by the improvement schemes are to contribute, either in kind or coin, one third of the amount provided to them by the Government, and also suggested tentatively that these sums are to be devoted for the development of rural sanitation, water supply, loan and sale co-operative societies and communications. They have also called for further proposals regarding the utilisation of the grants and the running of the schemes from the district collectors and district economic councils about whose formation we referred to in our July number.

From a perusal of the proceedings of these councils so far as they have been reported, we note that the general plan of work seems to be to form divisional subcommittees who are to survey the conditions in their area and select suitable centres to serve as model villages where all the improvement schemes are to be concentrated. There is a tendency to divert almost all the amounts on items like construction of godowns, roads and culverts, village halls of latrines, and sinking of wells, which, though highly useful and essential in indirectly augmenting the villagers' residual income and improving their health, are impersonal in nature. It appears to us that no adequate stress has

been laid, except in the case of two districts, on the human and cultural aspect.

It is too well known that if any work of amelioration has to have a lasting effect, it has to be broadly based on a firm foundation of a will to improve. We have to profit by the lessons of experience taught by the working in the villages of the co-operative movement which suffered in the past for want of proper education and training of the members on questions relating to co-operation. If the drive for reconstruction is to be of permanent value, it is necessary to see that not only the curiosity of the villagers is roused, but also their outlook is widened, their aspiration elevated, and their leisure utilised for mutual help and corporate action, such that they may take an abiding interest in the several activities of the economic councils, abandoning their proclivities towards faction and never ending litigation. The Royal Commission on Agriculture in India realising fully the importance of this aspect of improvement, have emphasised on the idea of village guidance along with their recommendations for the material improvement of the agricultural population.

We feel, therefore, that one of the primary tasks of our district economic councils should be the creation, in the minds of the villagers, of a desire to lead a cleaner and better life, and of an interest to work together for the common welfare. It is essential in order to reach this goal early to employ an agency to train and guide them in the right direction. It is also necessary that such an organisation should be constituted from the villages themselves as anything external will have no rural touch and will not outlive long after the protecting hand of Government is removed. We cannot do better than invite the attention of the readers to the measures adopted at Bairampally by the Village Industries Association, South Kanara-a purely private body. They have divided the village selected for rural welfare work into ten blocks, each containing 20 to 25 houses, and entrusted each one of them to a member of a volunteer corps called '*grama sevakas*'. The members of this corps are elected from the villages and trained in all aspects of rural improvement work by holding special classes, prior to their being put in charge of blocks. The above system ensures local interest and is therefore worthy of adoption in all model villages.

We would also suggest that along with various proposals formulated by each council, sufficient provision may be made in their budget for the importation and breeding of milk yielding types of goats—in some cases buffaloes too—and for the rearing of fishes in all ponds, wells and tanks, with a view to improve the nutritional side of the village population. Arrangement may be made with the Revenne departments for the planting of trees like *Gliricidia maculata*, *Pongamia glabra*, *Poinciana elatra* (Vadanarayanan) on the bunds of lakes, channels, (Pungam) drainage canals, and enjoyment of their leaves for green

manuring purposes. Adequate attention will also have to be paid for the collection of all decomposable material lying neglected in the village sites, field bunds, poramboke lands, and for their conversion into compost, the incorporation of which will be of immense value to all Indian soils.

Reduction of Railway Freight on Cattle. We are gratified to observe that the huge differences in the number of wagons carrying cattle to and from Bombay every year have created a stir in the minds of such an influential body as the Indian Merchants Chamber, Bombay. Its working committee estimates an annual loss of 20,000 calves and 20,000 dry cows in the city of Bombay due to want of sufficient space in the cattlesheds and to prohibitive railway freight which preclude the cattle owners from rebooking the animals that have gone dry back to the country side. We wish to add that the conditions obtaining in the city of Madras are not in any way brighter. Hundreds of valuable cows are being imported every year from Nellore, and these never return home when they no longer serve the purpose for which they were brought. The high cost of fodders, the expensive accommodation at Madras, and the heavy railway freight to the nearest grazing area which is more than 100 miles from the metropolis, compel the milk-men of Madras to part with their erstwhile wage earners at a nominal price mainly to the slaughter houses. We consider that the request of the Committee of the Indian Merchants' Chamber to the Railway Board to lower the freight of cattle booked to and from the big cities and towns is a welcome one, and has come none too soon in the day.* We feel sure that our agriculturally minded Viceroy will, with his profound interest in the improvement of cattle in India, spare no efforts to maintain the existing good milk breeds from being reduced to small numbers. We rejoice to learn that at the instance of the Viceroy the Railway Board were pleased to show recently considerable concession in railway freight for dry cows exported from Calcutta. This response gives us hope that the same concession will be extended by the Railway Board to all other chief cities in India.

Announcement.

We are glad to announce that Mr. G. R. Hilson, formerly Director of Agriculture, Madras and one of our oldest members, has very kindly offered to become a patron of the Union. We hope that this good example and large heartedness will be emulated by many of our members and subscribers.

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* Since writing the above we are glad to note that the Madras Provincial Marketting Board have made similar recommendation on the reduction of the railway freight on cattle.—*Editor*

STUDIES IN SUGARCANE II**

Performances of canes as influenced by environmental conditions.

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Introduction. The protection granted to sugar industry afforded a fresh impetus for a closer and more intensive study of the several problems relating to sugarcane and its products. One of such problems that is considered of importance is an investigation into the possibilities of extending the existing short milling season, thereby to provide a longer working period for the sugar factories. If one has to make any recommendation in this direction, a knowledge of the behaviours of different cane varieties under the several changing seasonal conditions in different localities is of primary importance.

With a view to study integrated effect of the climatic and the seasonal factors on the growth of cane and on the composition of its juice, a large number of cane varieties like seven sugarcane—sorghum crosses Co. 351 to Co. 357 and cane types Co. 213, Co. 281, Co. 285, Co. 290, J. 247, P. O. J. 2878, and purple Mauritius, were planted every month from September 1932 upto August 1933, on six Agricultural Research Stations, viz., Anakapalli, Samalkot, and Maruteru in the Northern districts and at Coimbatore, Aduturai and Palur in the Southern districts of the Presidency. The actual number of varieties planted on each station however differed.

The canes were periodically analysed and at the time of each analysis data in regard to the average weight, length, girth and the number of internodes for each variety were collected to follow the vegetative development of cane in relation to the chemical composition of its sap (cane juice).

As the bulk of the data collected was very large, it is proposed to deal with it in two parts, viz., (i) the general tendencies of canes as influenced by season and locality and (ii) the detailed examination of the individual varieties under different conditions with a view to explore the possibilities of extending the present short milling season. The present communication deals with the first part. As all the varieties tried exhibited striking similarities in their general behaviour, the variety Co. 352 is chosen for illustration, as this is one of the varieties common for all the stations.

In a previous communication (Viswanath, Ramasubrahmanyam and Varahalu, 1933) results of some preliminary studies in this

* Paper accepted for Ramasastrulu—Munagala Prize, 1936.

* Visvanath B, et al. The Indian Journal of Agricultural Science, Vol. IV, Part I, February, 1934.

direction were reported. Therein, a brief statement of the chemical studies on the ripening of sugarcane—sorghum hybrids planted in the months of March, April, June and September of 1932 were considered. The results of studies embodied in the present paper constitute an extension of the same.

I

Comparative rainfall and general climatic conditions at the six stations:—The data of monthly rainfall and of the rainy days on the six stations during the experimental period are represented diagramatically (Plate I). The differences in the rainfall conditions as revealed by this are not accidental to the experimental period, but are fairly general.

From the data the following points become clear :—

(1) At all the stations, excepting Coimbatore, the average annual rainfall is nearly the same, only the manner of its distribution is different. At Anakapalli, Samalkot and Maruteru, the greatest portion of the total rainfall for the year occurs during the South West monsoon period, June to September, when the days are long, the nights short, and the weather is generally warm. Thus at these stations a plentiful supply of water, high atmospheric humidity, and greater warmth and sunshine, all the factors conducive to good vegetative growth obtain during this period.

At Aduturai and Palur on the other hand the conditions are the reverse. The period of heavy rainfall—North East monsoon period—synchronises with comparatively cooler months, when the days generally tend to get short and the nights long.

2. The dry period generally commences at Palur and Aduturai only from late January, whereas at the stations in the Northern districts it begins even a month earlier, and extends in all cases upto March. This period is throughout cool.

3. While the hot weather period from April to June is common for all the stations, the following warm months July to September are generally comparatively less humid with less rainfall at Aduturai and Palur, unlike at the stations in the northern districts, Anakapalli, Samalkot and Maruteru. Thus at Aduturai and Palur, unlike at the other places, there is more or less a continuous period of hot or warm months, April to September, with comparatively less of rainfall.

4. It may be mentioned here that the number of rainy days either for the whole year or for any part of it being comparatively less, it is in effect the conditions which obtain during the rainless days which form the greatest part of the year, that go more to tell upon the performance of crops. The easy availability of water, and the degree and duration of the atmospheric humidity caused by the rainfall, only serve either to modify or reinforce the effects of the season.

As will be seen later, these differences in the relative distribution of rainfall and the dry periods at the several stations are reflected in the performances of canes.

II

Some factors influencing the growth of cane and the concentration of juice:—In this section it is proposed to study the influence of the external seasonal conditions on the vegetative growth of sugarcane and on the concentration of its juice. For this purpose the vegetative growth of canes as represented by the progressive height measurements, and the periodical variations in the concentration of juice as represented by the brix values (Table I) are followed. For illustration the data for the variety Co 352 at Anakapalli are chosen. The data are represented graphically (Plates 2 and 3). The periodical variations in the concentration of juice are shown separately for each of the crops planted in the several months (Plate 3 A). The graphs pertaining to individual crops are juxtaposed to bring out the integrated effect of the climatic and the changing seasonal conditions on the concentration of the juice. The curve represented by the broken line (Plate 3 B) illustrates the general trend of the progress of concentration during the several seasons of the year.

Comparing the growth curves with the concentration curves the following points are noticeable:—

1. The growth curves are very steep during months from June to September—October indicating vigorous vegetative growth. It was already mentioned that the seasonal and the weather conditions during this period are the most favourable for growth, as there obtain plentiful water, high humidity and greater warmth and sunshine.

2. During the months from June to October when the growth curves are steep, the concentration curve is showing a trough, thereby pointing that during this period the balance of solids in the sap is very low and that all the material synthesised is used up as quickly as it is formed in the building up of the vegetative tissues.

Thus the concentration of the juice tends to be a minimum when the growth tends towards a maximum.

3. The slopes of the curves from the month of October onwards indicate that all the crops are tending to slow down in growth from about this time of the year. The curves actually become flat, and continue to be so from about November—December to April—May. This period coincides with the one covered by the steepest part of the concentration curve, and the maximum concentration is attained at a time when the stationary part of the growth curve ends. Thus from October onwards, all the crops irrespective of their times of planting hasten to enter upon another phase of their life's activity, viz., that of quickly enriching the concentration of their juices.

Now, it is generally cool and the rainfall less from October onwards, unlike in the period immediately preceding it. The period from November—December to April—May can be split up into two parts:

(a) December to March, and

(b) March to May.

The first part of the period is characterised by being (i) clear and bright (ii) cool and dry, and (iii) windy. Further, the nights during this part of the year are long and the days short. The second part is characterised by (i) being hot with comparatively high temperature both during day and night, (ii) having a bright sunshine for a large number of hours in the day and (iii) inadequacy of water and low humidity. All these conditions tend to cause the loss of moisture and arrest growth.

From this it becomes clear that for quick accumulation of solids in the juices and for the attainment of full maturity, cool and dry conditions followed by increasing warmth are essential, and it may be expected that whenever such conditions prevail, the crop hastens to accumulate solids, irrespective of the state of its development at that time.

5. Again, two maxima are indicated in the concentration curves of different magnitudes. What is interesting is that both the maxima occur during about the same part of the year, thereby emphasising upon the greater potency of the season in controlling the concentration development in the cane juice. The differences in the magnitudes are owing to differences in the vegetative preparedness of the crops at this time of the year.

Thus, whatever be the stage of growth of cane, with the onset of proper seasonal conditions the crops hasten to enter upon the phase in its development which tends to lead on towards maturity.

6. While the tendencies considered so far are general, the crops planted in the several months show striking differences among themselves, as evidenced by the relative positions of the growth curves. It is easy to see that all those crops which had enough time to establish themselves before entering upon the period from June to October made good vegetative progress. When this time was insufficient, the vegetative growth suffered correspondingly.

From the foregoing it would appear that in the cycle of the seasons of the year, there is a season specific for the development of each one of the phases in the life of the cane. There is a season during which the vegetative growth alone is promoted more, and another during which the growth is arrested and the concentration of the juice is enriched quickly at greater rates until final maturity is attained. On any cane crop which passes during these seasons their

independent effects are impressed, and the degree of the impress of each season is conditioned mainly by the state and the preparedness of the crop to receive it at that instant. The performance of the cane at any given time in the year is thus a resultant of the effects of (i) the several seasons through which it passes, (ii) the preparedness of the crop, and (iii) the inherent capacity of the cane. This latter aspect will be considered in a separate part as was already indicated.

It will be seen that all these general observations find confirmation from the detailed analytical data to be examined hereafter.

III

Examination of the analytical data. As the canes are planted in several months, they should obviously be of different ages, on any day of harvest or analysis. Therefore the performances, at any given time, of these crops, planted in the several months should go to indicate the influence of the seasonal conditions which happen to prevail at that time, and perhaps for some time previously, irrespective of their ages. For illustration, the brix values representing the concentrations of juices (Table I) are plotted against their respective ages (Plate 4).

(a) *Concentration of juice as influenced by season.* An examination of the data and of the graphs leads to the inference that irrespective of the age of the crops on any one day, the juice of cane generally indicates almost the same degree of concentration.

Barring minor differences due to differences in location and other causes, all the graphs in each station showing the brix values run almost parallel to the age axis. Again, the several graphs in each station range themselves in regular stairs one above the other. In the more advanced months of the period from June to April, the levels of the graphs are in general progressively higher in the scale of brix values.

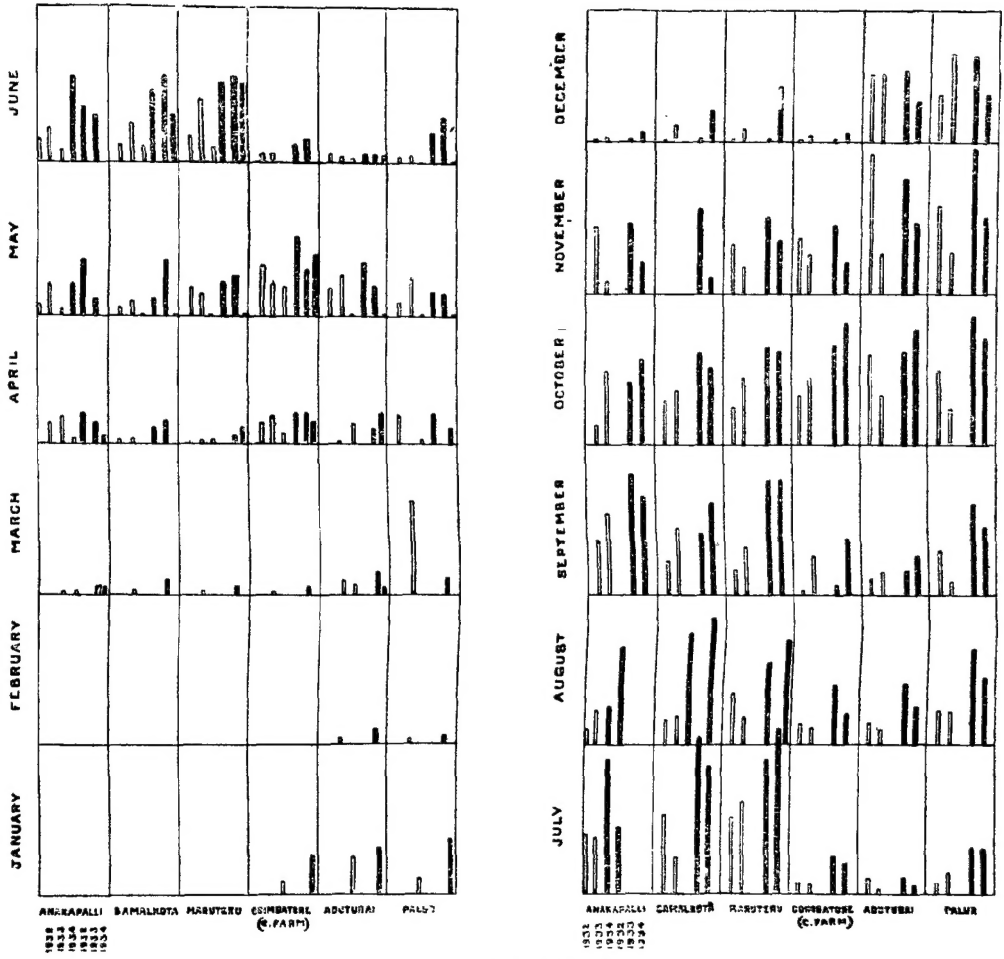
Thus it becomes evident that so far as the concentration of the juice is concerned, as measured by the brix values, the most potent factor which goes to influence it is the climatic or the seasonal conditions which obtain at the time of harvest, and not the mere age of the crop as is ordinarily supposed. During the period when cool and dry conditions prevail, and when high temperatures obtain, the concentrations are fairly good, and during the rainy months they are very poor.

Although the concentrations as seen here are very similar at any one time for crops of different ages, the several crops seem to differ in other respects. The July planted crop for example, has comparatively lower weight, and lower values for T/B (Brix of juice from top half/ Brix of juice from Bottom half) ratios. These differences will be considered presently.

(b) *Relation between the age of the crop and the performance of the cane.* There appears to prevail a general belief that if a cane crop

PLATE I.

Rainfall distribution during the Experimental Period.



= Rainfall in inches.

= No. of Rainy days.

Plate II. GROWTH OF CANE Co. 352 ANAKAPALLI

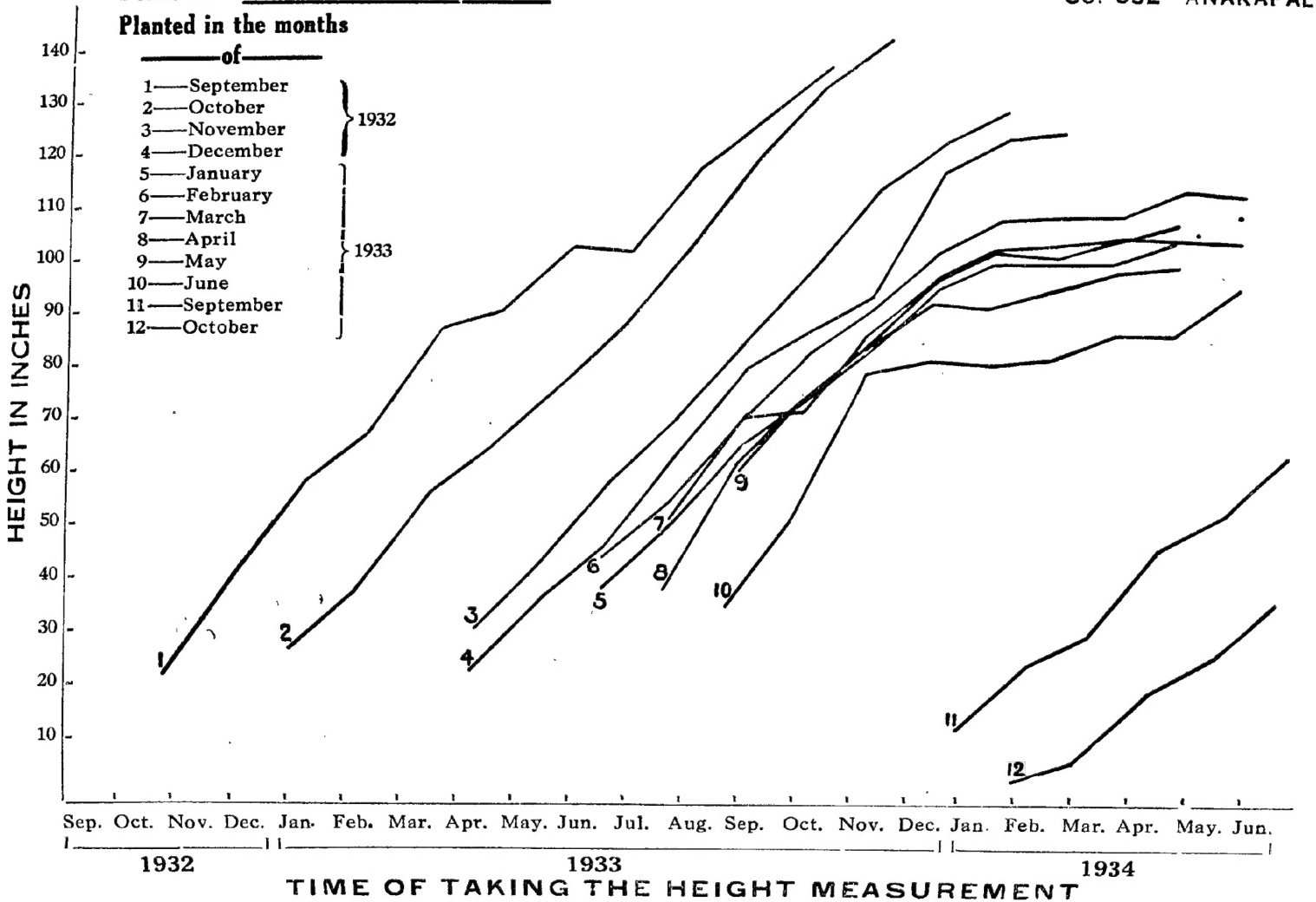
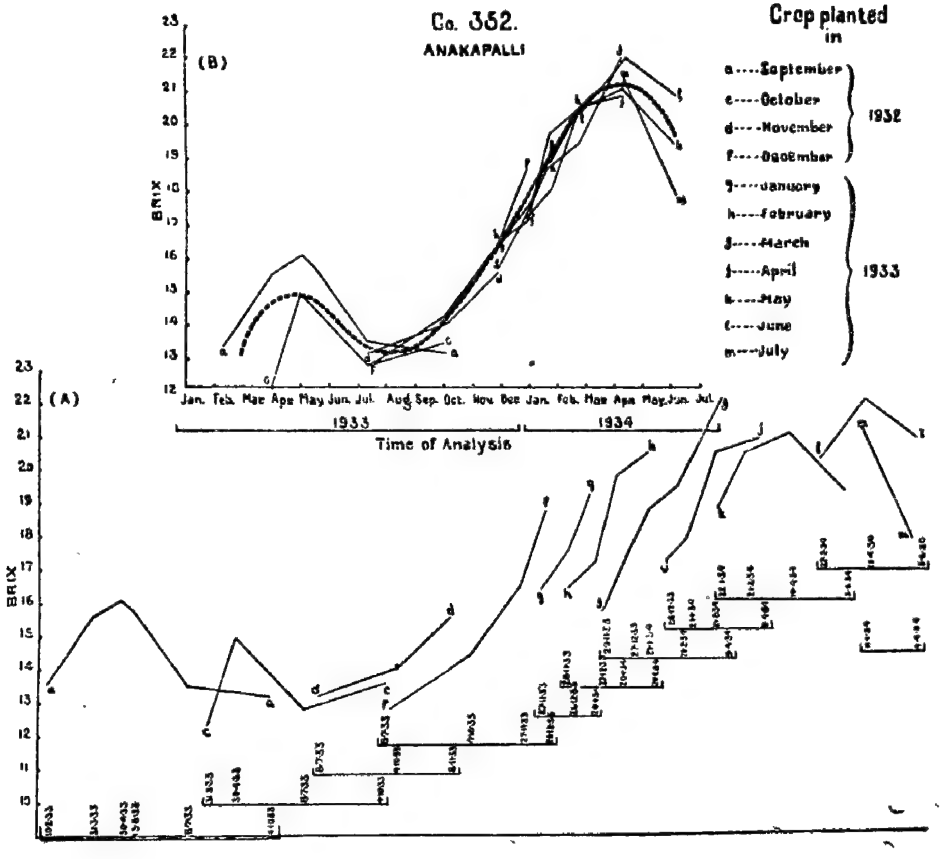


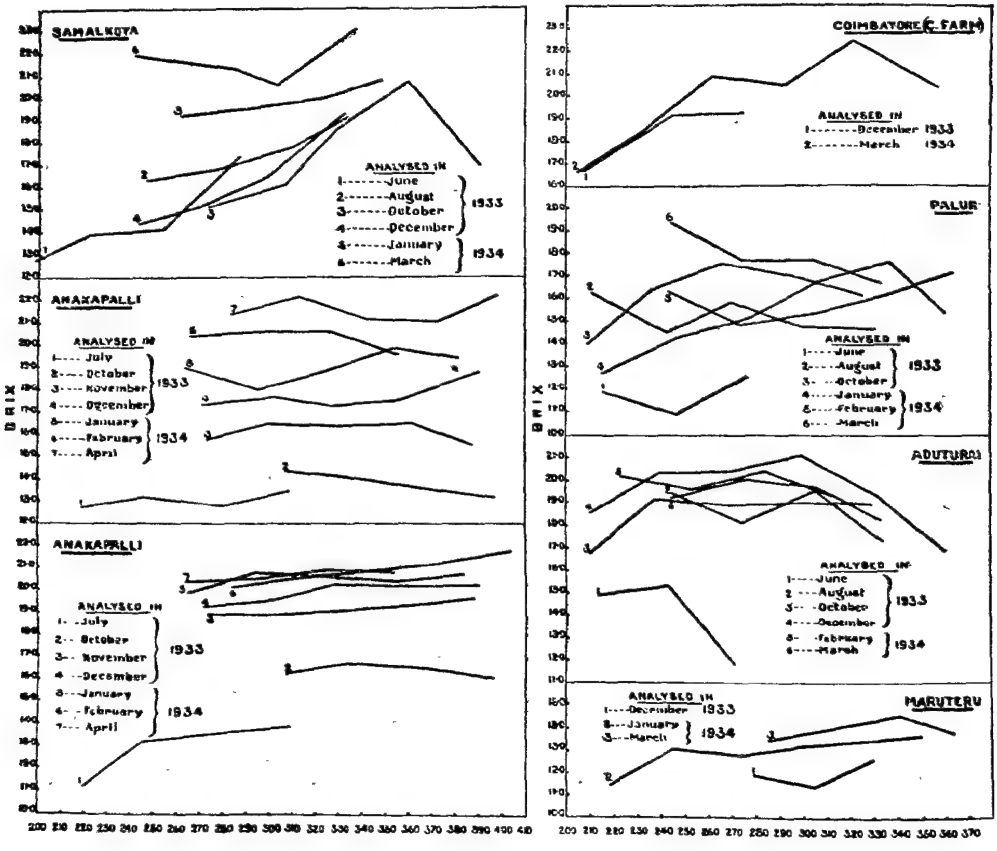
PLATE III



Periodical variations in the concentration of the juice.

PLATE IV.

Influence of season on the concentration of juice.



Age of crop in days.

grows about a year, it will ordinarily be fit for harvesting. In what follows an attempt is made (i) to verify the tenability of this belief, and (ii) to know whether it is merely the age of the crop which controls the maturity of cane, or other factors concomitantly influence it.

As canes are planted in different months of the year and analysed periodically, it is possible to get canes of equal ages at different times of the year. Although such canes are of nearly equal ages, they obviously differ from each other in that, that before attaining to that age, they must have passed through widely different seasons during the year. The analytical data of canes of equal or nearly equal ages are grouped together and presented in Table II. A careful perusal of the data presented shows that mere age of the crop is not a criterion or a measure of its maturity. The seasons of the year through which a crop passes during its stand, the particular order in which it faces them, and the duration of its stay in each one of them, appears to have a stronger bearing on its performance than merely its age. The performances of canes at some typical ages are considered below:

Cane crops 210—220 days old. At this age of 7 to 7½ months the crops are no where near maturity, irrespective of the time of planting. Among themselves the lower concentrations are generally indicated by all those crops which are analysed during rainy months. The general level of concentration is also low at this age, the brix values ranging from 12—16. The T/B ratios are also very low (0·73—0·90), indicating extreme states of immaturity.

Cane crops 235—245 days old. At Samalkot the crop planted in December and analysed in August is poorer by 5—6 units in concentration (brix: 14·4) than the crops planted in July and analysed in March (brix: 21·9), although both are of the same age. The latter however have only half the average weights of the former, the weights being 1 lb. and 1·9 lbs. respectively. The April planted and the December analysed crop also shows similar differences.

At Anakapalli, the crop analysed in April has a better average weight per cane than what was planted in November and analysed in July, the respective weights being 2·3 lbs. and 1·2 lbs. The compositions of juices in both cases are poor. But between the two the April analysed crop is comparatively much better both in purity and in concentration. (Purity: 79·43 & 73·34; and Brix: 16·1 & 13·2 respectively.)

Again, at Aduturai, the July planted crop is at its best in March in respect of its composition, while the average weight of the cane is poor (Av. wt.: 0·90 lb. & Brix: 19·5; Purity: 88·0; & T/B: 0·97).

The crop planted in December and analysed in August has also a high brix (19·5) and high purity (88·0) but very low T/B ratio (0·90). The crops analysed in October and December also indicated immaturity.

Cane crops 250—265 days old. At this age of about 8½ to 9 months the differences in the performances of canes planted in the different months are more strikingly exhibited than at the younger ages. All those that are analysed in May, June and December show high purity (82—85) but have extremely low T/B ratios (0·83—0·88). As such they cannot be taken to be quite mature. Their concentrations are also generally poor. (Brix : 14—17).

Cane crops 276—285 days old. At Aduturai the crop planted in the middle of May is very ripe at this age as revealed by the analysis done towards the end of February (Brix : 20 ; Purity : 89·8 ; T/B : 1·03). At Anakapalli, the two crops, the one planted in October and analysed in July, and the other planted in July and analysed in April, exhibited marked differences. In the one case the composition was poor and the average weight of its cane is comparatively much higher, (Brix : 12·89 and Wt. : 1·70 lbs.), while in the other it is the reverse, (Brix : 21·3 and Wt. : 0·95 lbs.). At Samalkot the September planted and the June analysed crop, and the crop planted in June and analysed in March, exhibited similar differences. Differences of like nature are also to be seen among crops at Maruteru.

Cane crops (286—296) & (297—307) days old. When planted between March and May the cane appears to come to full maturity in about 9½ to 10 months. The poor analyses recorded are all for those crops which are planted in the months of August, October and December and analysed in August and October. Between the performances of canes in August and October at Aduturai and at the stations in the northern districts, there are wide differences, and these are in favour of Aduturai. It will be noted that between August and October, the conditions at Aduturai are comparatively more favourable for the cessation of growth and for leading the cane towards maturity. This point will be referred to again later.

Cane crops 360 days old and above. To take a typical example, the analysis of the crop planted at Anakapalli in September 1932, and analysed in October 1933 is very poor even after standing for 14 months (Brix : 13·2), while it has a very high average weight per cane (3·55 lb.) A crop of the same age but planted in the month of March and analysed in the month of April of the subsequent year stands in striking contrast. It has half the average weight of the first (1·53 lbs.) and nearly double its concentration, (Brix : 22·2).

All other data also show similar differences in their performances in spite of their advanced ages.

Thus the data discussed appear to point to the following :—

1. Mere age of the crop without reference to the time of its planting affords no indication of its maturity.

2. It is not only the age, but more potent than this in controlling the performance and the maturity of a cane, are the seasons of the

year through which the crop passes during its stand, the order in which it faces the several seasons, and the duration of its stay in each one of them.

3. Depending upon these differences, in crops of equal ages, either vegetative growth alone is promoted in some, or improvements in the concentration of the juice alone are caused in others. In properly timed plantings, normal development, both in vegetative growth and in concentration, takes place.

4. These observations lead to the necessity for a proper choice of the time of planting and of harvesting with reference to the seasons and the rainfall conditions which obtain in any given locality.

IV

Differential behaviours of canes planted in several months on any one station, and on different Stations. The detailed analytical data of the several plantings on the six stations are tabulated and appended, (Table I). An examination of the data reveals that the crops planted in the several months, while exhibiting a similarity of behaviour in their general tendencies, showed among themselves marked differences in their performances. The differences in any one station are exhibited in a number of ways, viz., in the matter of the progress of (a) vegetative growth as shown by weight and height of cane, (b) concentration of juice as evidenced by brix value, and (c) quality of juice as indicated by the values for the purity, glucose, glucose ratio and T/B ratios. Again, the performances of canes planted in certain months on the stations at Aduturai and Palur on the one hand, and at Anakapalli, Samalkot and Maruteru on the other, differ markedly in important respects, consequent on the differences, as already noted, in the sequence and durations of the seasons and conditions obtaining on the two sets of stations.

a) *Vegetative growth:* At the stations in the Northern districts for example the following points are observable:—

1. With increase in age the average weight of cane is steadily increasing during the months after May upto October—November. In all the crops the weights do not indicate any considerable increases from November onwards to April—May, in spite of advancement in ages. These observations on the weights of canes comfirm those made earlier from a consideration of the growth curves that during June to October growth is promoted more, while it is arrested from about October to April—May.

Again, the crops planted from September to December of 1932 made a more rapid progress in growth during the South West monsoon period of 1933 than those planted in the months from January to July of 1933, during the same period. Even among the latter plantings themselves, the growth was somewhat progressively diminishing, the growth put on by the July planted crop being the least.

Obviously, the rate at which the vegetative progress is made, even during periods when conditions most favourable for it are prevailing, depends upon the prior preparedness of the crop by way of previous establishment to take advantage of these conditions.

b) *The progress of concentration of juice*: In all the crops tendency is noticeable that the concentration is moving towards a maximum by the month of April. Even much earlier than April, the crops planted from January to April of 1933 attained a fairly high level of concentration late in January of 1934. Not only this, they further continued to improve both in magnitude of concentration and in the quality of the juice.

The May and the June planted crops showed higher levels of concentration in February and March. Judged by their performances in February, it would look as though that they would have also fared well in January, like the previous ones, at ages of 8 to 8½ months.

The July planted crop was good and in fact was at its best in composition in April at an age of about 9½ months. Like the May and the June crops, it might also be expected to show a fairly high degree of concentration a fortnight or two earlier at an age of about 8 to 8½ months, in March.

Although its composition taken by itself is very good, it differs from those which preceded it in that it has very low weight and very low T/B ratio, indicating that if this cane is crushed even in the month of April, the yield of cane would be less, and that the top half of even this small cane would be very immature, and so would adversely affect the quality of the composite juice.

The September and the October planted crops also tended to show a maximum brix by about April—May at ages of about 8—8½ months, as was already noted. But the performances of these crops differed from those of the plantings made from January to June in the following respects:—

(i) The magnitude of the maximum itself is less,

(ii) The quality of the juice is poor, and

(iii) Even this maximum value did not remain at that level for long. It quickly fell hardly standing even for more than a month, whereas in the rest considered so far, a high brix value was not only attained early in the season, but they also went on improving further for more than 2½ to 3 months, the period decreasing in all the later plantings.

Thus the September and the October plantings could not show at the ages of about 8 to 8½ months what the crops planted from May to July could show at similar ages far as the quality of the juice is concerned, these crops showed more pronouncedly what the July planted crops tended to indicate in the month of April.

The November and the December planted crops were too young to show even this tendency in the crushing season immediately following their planting. These considerations show that while the influence of the season in controlling the juice concentration is fully exhibited as revealed by the brix values, yet it appears essential, as evidenced by the data here considered, that the crop has to put on certain minimum amount of vegetative growth to be able to take full advantage of the favourable conditions of the season, and that this minimum is attained only by the crops planted from January to June. The rest of the plantings are defective either in weight, or in concentration, or in quality of juice, or in all these respects, in the milling season immediately following their planting.

Again, comparing the behaviours of the November and the December planted crops, it will be seen that in the month of December of the subsequent year, at ages of about 13 to 14 months, they exhibited a fairly high level of concentration. The quality of the juice and the T/B ratios were good. Further, they possessed the additional advantage of a good average weight for cane. Now, December is the earliest part of the period favourable for improvements in concentration to take place. How the September and the October planted crops would have also fared, had they also been allowed to remain till December of the subsequent year, it would have been interesting to follow, but no analysis was however made. From the foregoing considerations, it would appear that those canes, which are vegetatively fully prepared, by the time the seasonal conditions favouring concentration of juice occur, are the first to take advantage of these conditions. It would also become evident that the mere attainment of a high degree of concentration does not always connote an equally high degree of quality in the juice. The improvements in quality follow the improvements in concentration, as indicated by the brix values.

Again, comparing the performances of canes on the three stations in the Northern districts, representing one tract of the presidency, one sees that while at Samalkot and Maruteru the several crops behaved almost similarly as they did at Anakapalli, the crops on these two stations, were comparatively much better throughout both in weight and in concentration and quality of juice. These differences in all corresponding crops are probably attributable to the differences in the local conditions of soil.

Comparative study of the several plantings made in the northern and southern districts. The general behaviours of the plantings made from January to May and also partly in June on all the six stations are very similar.

2. The plantings made in other months, especially in months from September to December showed marked differences probably

consequent upon the differences in the conditions obtaining on the two sets of stations.

3. The average weights for individual canes at Aduturai and Palur are very low. Between these two stations in the south, those at Palur are higher. The weights of canes for corresponding crops grown at Anakapalli, Samalkot and Maruteru, are very high. For example the weights of canes grown at Anakapalli varied from 2·0 to 3·0 lbs, while those raised at Aduturai ranged from 0·34 to 0·62 lb.

4. So far as the cencentrations of the juices are concerned, even by the month of August all the plantings made from September to December indicated at Aduturai considerably higher values. At this place, at ages of 11, 10, 9, and 8 months they showed the following ranges of values : brix: 17·3 to 19·6; purity: 84 to 89; T/B raio: 0·88 to 0·91. These latter values however indicate immaturity, In the crops at Palur, the purity values ranged round about 81, and the T/B ratios varied from 0·95 to 1·0.

At Anakapalli and Samalkot on the other hand the positions were the reverse. The concentrations were considerably lower in the month of August, the brix values for all the crops at Anakapalli being below 15, and the values for purity being between 70 and 80. The T/B ratios also were low. At Samalkot too, similar low values were noticeable. (Brix: 14–16: Purity 67–78 ; T/B: 0·78–0·82).

5. While at Aduturai and Palur between the analyses in June at the age of 9, 8, 7, and 6 months and again in August at ages of 11, 10, 9 and 8 months there were invariably observable improvements in concentration by big jumps, by about 4–5 units at Aduturai, and by 3—4 units at Palur, it will be seen that at Anakapalli and Samalkot there is particularly no improvements in concentration taking place during this period. Similar improvements in big strides however are noticeable at these latter stations during periods after August onwards as already mentioned.

6. Between June and August at Aduturai and Palur, the glucose ratios fell considerably lower, indicating a better improvement in quality of juice, while at Anakapalli and Samalkot, they were throughout comparatively very high. In the first two stations the values fell from (0·98—2·0) in June to (0·1 – 0·4) in August, indicating improvements in quality. At Anakapalli and Samalkot, these values were throughout very near 1·0 and of the two stations, they are more conspicuously so at Anakapalli.

7. Again, between the June and the July planted crops at the two groups of stations, similar differences are noticeable. The values for glucose contents of juices at Aduturai for these crops during the

months of February, March and April, are considerably lower, being less than a third of those for the corresponding crops at Anakapalli.

8. Again, for the July planted crop, T/B ratios are very low at Anakapalli indicating immaturity during months when these crops at Aduturai were showing high values, very near unity, indicating maturity.

All these differences in the behaviours of corresponding crops on the two sets of stations are easily explainable on the basis of the difference obtaining in the seasonal and the rainfall conditions on these stations, which were considered in an earlier section.

VI

Thus far, the differential behaviours of the canes as influenced by the seasonal conditions on the several stations were considered and their similarities compared. It will be seen however that there occur occasionally certain apparent contradictions to the general observations made in respect of the variations in the concentrations. It may be noted that such exceptions occur only during periods of transition from season to season. This is owing more to the inertia in their readiness or capacity to adjust and respond to the changing conditions. The degree of the inertia exhibited varies with variety, e.g., of the two varieties Co. 351 and Co. 352, representing respectively the early and the late types, Co. 351 responds more quickly, while the other exhibits greater inertia. These and other similar differences in the behaviours of the same variety, and of different varieties, will be considered in a separate communication. It is enough for the present to say, that any contradictions or exceptions noted are only apparent, are but particular cases of a general phenomenon which has been considered in this paper in its broad outline.

Summary and conclusions: 1. The performances of a number of sugarcane varieties planted during 11 months of the year from September 1932 to July 1933 at six stations in the presidency, were followed, at several stages of their growths and the general tendencies revealing the integrated influence of the seasons on their performances were discussed choosing Co. 352 as a type.

2. Rainfall and seasonal conditions in the different localities are studied, and correlated with the differential behaviours of the canes in the several localities.

The research stations in the Madras Presidency appear to be classifiable as (i) the Circars group, and (ii) the Southern group, according to the prevalent climatological conditions. The Circars group appears to enjoy a sequence of climatic factors more favourable for the growth of cane than the southern group. Canes planted in certain months at

the two different groups of stations therefore exhibited differences in their behaviour. In tracts which Aduturai and Palur represent, it looks as though that the period from August to October is useful additionally for harvesting purposes.

3. From this study it would appear that sugarcane has four major phases in its life cycle: (a) establishment, (b) growth, (c) elaboration and accumulation of the necessary raw materials and (d) final ripening or maturity. There are a set of seasonal conditions specifically favourable for each of these phases in the development of cane. The conditions occur in different months of the year in different localities.

There are no clear cut lines of demarcation between these several phases of activity or between the times when these conditions favourable for these activities occur. They in fact overlap. All the processes take place simultaneously at any given time, but only at varying rates: the process most favoured by the particular seasonal conditions takes place at the greatest speed and the rest only more slowly at that time. The performance of a cane crop at a given instant is thus the resultant of the effects of the several conditions operating on it at that instant.

For any cane crop to come up normally and yield good results, the time of planting must be so chosen with reference to the sequence of the seasonal conditions in any given locality, that the crop is enabled to pass through the several phases in its life cycle in the order indicated, and stay for sufficient time in each one of the seasons favourable for these phases of activity.

Any deviation in this order, or any undue shortage of stay in any of these seasons, imposes a handicap on the crop to the extent of such deviation or shortage of stay. These deviations affect either the vegetative development, or the concentration, or the quality of the juice, or all these.

4. A minimum of prior vegetative growth appears to be an essential condition for the crop to take advange of the seasonal conditions favourable for either good vegetative growth or for improvements in concentration.

5. The concentration of juice tends towards a minimum when the vegetative growth tends towards a maximum. The concentration tends to improve in rapid strides to attain a maximum, when the growth tends to stop.

6. The age of the crop is by itself no criterion of its maturity as is ordinarily believed, for the reason that the sequence of the seasons during which its life cycle is spent, has more effect on its growth, devevlopment and ripening, than age.

7. The concentration as expressed by brix values does not always appear to indicate the quality of juice. Improvements in quality follow improvements in concentration.

8. A cane crop can be allowed to stand for a period of about three months after maturity without deterioration setting in, but the period is shortened with the incidence of hot dry weather.

Plantings made very late attain high concentration only very late in the season favourable for the process. Further, they also quickly fall off.

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Table I.

Age of crop at time of analysis. days.	Date of analysis.	Average weight of single cane. lbs.	Brix %	Sucrose %	Glucose %	Purity %	Glucose ratio.	Top/Bottom ratio.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Anakapalli. Co. 351. (Field No. 2).					
			September 1932 planted crop.					
161	10—2—33	0·87	14 37	9·88	1·75	68·77	17·69	0·69
210	31—3—33	1·33	15·38	12·54	0 91	81·55	7 22	0 82
240	30—4—33	1·45	17·07	14·71	1·50	86·20	10·16	0·83
253	13—5—33	2·05	16 54	13·92	1·34	84·14	9·65	0·87
309	8—7—33	2·12	13 90	11·12	1·70	80·00	15 29	0 90
397	4—10—33	2·85	16·10	12·64	1·35	78 52	10·68	1·00
			October 1932.					
181	31—3—33	0·82	10·55	7·28	1 99	69·0	27·34	0 60
211	30—4—33	1·28	14·27	10·57	2·54	74·1	21·02	0·75
280	8—7—33	1·64	13·60	10·66	1·70	78·4	15·95	0·83
368	4—10—33	2 55	16·57	13·48	1·16	81·4	8 61	0 94
			November 1932.					
245	8—7—33	0 86	13·2	9 67	2·22	73 24	22 94	0·97
333	4—10—33	1 59	16·77	13 47	1·32	80 30	9 80	0 87
388	28—11—33	1·60	19·68	18·26	0 61	92 76	3 34	1·00
			December 1932.					
219	8—7—33	0·76	11·18	6 53	2·48	58·42	35·80	0·79
307	4—10—63	1·43	16 27	12 64	1·61	77·71	12·74	0·85
361	27—11—33	1·60	19 31	17·87	0 86	92 53	4·81	1·02
390	26—12—33	1·60	20·24	18·52	0·29	91·52	1·56	1·03
			Anakapalli. Co. 352. (Field No. 2).					
			September 1932.					
161	10—2—33	1 02	13·37	8·68	0·91	64·90	10 53	0·79
210	31—3—33	1·88	15 68	12·52	1·13	79 85	8.91	0 80
240	30—4—33	2 30	16·09	12·75	1·55	79·43	12·16	0·79
253	13—5—33	2·43	15·74	13·47	0 92	85·59	6 86	0·84
309	8—7—33	3·10	13·50	10·90	1 42	80·74	13 00	0·96
397	4—10—33	3·55	13·18	9·04	1·79	70·24	19·81	1·14
			October 1932					
181	31—3—33	1·05	12·25	7·71	1·32	63·00	17 08	0·71
211	30—4—33	1·63	14·97	10 85	1·54	72 20	23 35	0 78
280	8—7—33	1·74	12·80	10 03	2·22	78 30	22 12	0 86
368	4—10—33	3·23	13·52	9·24	1·16	64·40	12·55	0 93
			November 1932.					
245	8—7—33	1·15	13·20	9·67	2·68	73·30	27·76	0·80
333	4—10—33	2·00	14·12	10·07	1·35	71·30	13·40	0·90
388	28—11—33	2 00	15·56	13·99	0 98	89·93	7·02	1·02
			December 1932.					
219	8—7—33	1·10	12·80	9·18	2·22	71·71	24·16	0·95
307	4—10—33	1·86	14·37	11·17	1·25	77·71	11·19	0·89
361	27—11—33	2 20	16 49	15·40	0·61	93·40	3 96	1·04
390	26—12—33	2·20	8·81	16·94	0·39	90·07	2·29	0·98

TABLE I (*Continued*.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Anakapalli. Co. 352. (Field No. 2-A).					
			January 1933.					
328	27—11—33	1·0	16·36	14·67	0·73	89·7	4 97	0·99
357	26—12—33	1·3	17·61	15 80	0 45	89·7	2·81	1·03
381	26—1—34	1·35	19·34	17·67	0·29	91·4	1·64	1·02
			February 1933.					
299	27—11—33	1·50	16·49	15·16	0·85	91·9	5·62	1·02
328	27—12—33	1·40	17·24	15 10	0·75	87·6	4·99	1·05
353	20—1—34	1 60	19 84	18 11	0·30	91·3	1·65	1·05
384	20 —2—34	1·52	20·55	17 94	0·50	87 3	2·80	1·07
			March 1933.					
2·3	29—11—33	1·50	15·83	13·73	1·00	86·7	7·29	0 97
301	27—12—33	1·38	17·64	15·34	0·68	87·0	4·43	1 03
326	21—1—34	1·56	18·94	17·36	0 53	91·6	3·11	1·04
356	20—2—34	1·36	19 55	17·10	0 77	87·48	4·52	1·05
404	9—4—34	1·53	22·19	19·93	0 45	90·10	2 26	1·08
			April 1933.					
271	28—12—33	1 34	17·31	14 66	1·09	84·70	7 42	1·01
295	21—1—34	1·02	18·04	15·53	0·83	86 10	5·36	1·05
326	1—2—34	1·67	20 58	18·52	0·41	89 99	2 21	1·09
374	9—4—34	1·54	21 07	19·01	0·69	90·20	3·63	1·05
			May 1933.					
264	22—1—34	1·34	19·04	16·91	0 48	88·8	2 86	1·02
294	21 —2—34	1·47	20·58	18·38	0·46	89·32	2 51	1 04
342	10—4—34	1·45	21 17	19·01	0·63	89·80	3 33	1·09
396	3—6—34	...	19·52	15·97	0·95	81·85	5 92	1·04
			June 1933.					
266	22—2—34	1·20	20 42	17·93	0·74	88·08	4·15	1·01
313	10—4—34	1·34	22·17	19 84	0·47	89 54	2 39	1·05
367	3—6—34	...	21·03	19·00	0·53	90 36	2·80	0·99
			July 1933.					
284	11—4—34	0·95	21·32	19 22	0·39	90·24	2·05	0 88
338	4—6—36	...	17·94	15 59	0·62	87·08	3·97	0 89
			Samalkot. Co. 351.					
			September 1932.					
286	22—6—33	1·55	19 90	16·91	0·76	84·90	4 47	0·90
332	7—8—33	1·65	21·07	18·05	0·23	8 69	1 28	0 99
392	6—10—33	2·08	19·63	16·75	0 56	85·31	3·34	0 96
			October 19 2.					
253	23—6—33	0·80	15·98	12·77	1·45	79·91	11·39	0·82
299	8—8—33	1·35	16·63	13 01	1·00	78·21	7·68	0 82
359	7—10—33	1 78	20·79	17·70	0 63	85·13	3·56	0 96
			November 1932.					
221	23—6—33	0·70	15·16	11·33	2 52	74·73	22·7	0 77
268	8—8—33	1·18	16 13	11·76	1 43	72 93	12·15	0·81
329	9—10—33	...	2) 87	17·17	0·61	82·24	3 55	0·92
			December 1932.					
197	24—6—33	0·83	15·16	11 34	1·41	76·12	12·26	0·84
242	7—8—33	1·70	14 12	9 49	1 19	67 70	12·54	0·78
306	10—10—33	2·08	17·88	13·10	1·02	73·26	7 79	0 91

TABLE I (*Continued*).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Samalkot. Co. 352.					
			September 1932.					
286	22—6—33	2·78	17·4	14·64	0·68	84·16	4·65	0·84
332	7—8—33	2·75	19·37	15·39	0·45	79·43	2·92	0 95
392	6—10—33	3·15	17·01	14 07	0·31	82·71	2·20	1·05
			October 1932.					
253	23—6—33	1·13	14·16	11 97	1·86	84·55	15·53	0 83
299	8—8—33	1·78	16·63	12·96	0·96	77·94	7·41	0·83
359	7—10—33	2·03	20·79	17·70	0·25	85·13	1·41	0·92
			November 1932.					
221	23—6—33	0·95	13·95	10·69	1·93	77·34	18·10	0 83
268	8—8—33	1·60	15·13	10·83	1·25	71·58	11·54	0·76
329	9—10—33	...	18·67	15·48	0·60	82·92	3 88	0·89
			December 1932.					
197	24—6—33	1·3	12·84	8·76	1·95	68 22	22·21	0·87
242	7—8—33	1·9	14·42	11·34	0·86	77·56	7·59	0 83
306	10—10—33	2·3	16·18	12·40	0·67	76·65	5·40	1 13
			January 1933.					
273	11—10—33	1·98	15·20	11·61	1·14	76·4	9·8	0·90
334	11—12—33	2·47	19·28	16·91	0·42	87·7	2·5	0·98
			February 1933.					
309	12—12—33	2·45	17·88	15·07	0·71	84·3	0·71	1·00
353	25—1—34	2·45	21·01	19·44	Trace	92·5	...	1 05
			March 1933.					
278	13—12—33	2·77	16·88	13·66	0 92	80·9	6·7	1·08
322	26—1—34	2·90	20·01	17·83	0·33	89·1	1·8	1·01
			April 1933.					
246	14—12—33	2·00	16·37	13·69	1·12	83·6	8·2	0·99
290	27—1—34	2·17	19 51	17·49	0·33	89·6	1 9	1·08
337	15—3—34	2·32	23·12	20·67	0.14	89·4	0·69	1 03
			May 1933.					
261	29—1—34	1·65	19·25	16·94	0·33	88·0	2·0	1·00
303	13—3—34	2·00	20·65	18·76	0·27	90·8	1·4	1·02
			June 1933.					
285	13—3—34	1·32	21·35	19·16	0·20	89·73	1·07	0·87
			July 1933.					
242	14—3—34	0·97	21·92	19·64	0·17	89·58	0·85	0·96
			Maruteru. Co. 352. (Field No. A. I. A.)					
			August 1932.					
147	21—1—33	0·80	18·59	14·81	0·92	79 68	6·20	1·02
179	17—2—33	1·05	19·04	16·70	0·71	87·70	4·23	0·87
313	28—6—33	2·00	13·48	9·92	1·47	73·58	14·81	0·86
420	12—10—33	3·00	18·08	15·57	0·42	86·16	2·69	1·05
			September 1932.					
281	28—6—33	2·08	13·85	9·90	1·24	71·5	12·60	0·84
389	13—10—33	3·88	18·10	16·44	0·30	90·5	1·8	0·99
			June 1932. (*Dry*). (*Field F. 1. B.*)					
212	20—1—33	1·83	16·57	12·48	2·77	75·32	22·22	0·91
237	17—2—33	2·35	19·55	16·33	1·37	83·54	8·38	0·95

TABLE I (*Continued*).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
			June 1932. (Wet). Field K. 4 A.						
220	20···1...33	1·67	20·57	18·52	0·15	89 95	0·82	1·05	
247	19···2...33	2·08	21·35	19 66	0·27	92·08	1·38	1·02	
			January 1933.						
334	20 12...33	2·2	18·65	15·63	0·23	83·79	1 49	0·97	
355	12···1...34	1·8	19·64	17·54	0·21	89·30	1·20	1·02	
			February 1933.						
304	21···12···33	2·0	17·4	14·85	0·30	85·37	2·04	0·94	
322	8···1···34	2·4	18·04	15·56	0·31	86·26	2·00	0·97	
			March 1933.						
279	23···12···33	2·7	17·91	15·41	0·22	86·04	1·44	1·02	
296	10···1···34	2·3	19 12	16·70	0·31	87·36	1·86	1·04	
364	19···3···34	2·3	19·74	16·98	0·18	86·08	1·08	1·05	
			April 1933.						
274	11...1...34	1·6	18 71	16·01	0·29	85·59	1·80	1·04	
340	18...3...34	2·3	20·54	17·85	0·15	86·96	0·81	1·02	
			April 1933 (Swampy).						
257	6...1...34	1·2	13·85	11·11	0·71	80·21	6·39	0 92	
			May 1933.						
245	11...1...34	1·6	19·01	16·72	0·58	87·94	3·48	1·00	
309	15...3...34	1·8	22·84	20·32	0·23	88·98	1·13	1·00	
			June 1933. (Wet).						
218	9...1...34	1·5	17·43	14·63	0·74	83·97	5·08	0·96	
285	17...3...34	1·3	19 46	16·95	0·25	87·12	1·48	1·05	
			June 1933. (Dry).						
221	10—1...34	2·7	16·18	13·24	1·03	81·85	8·00	1·03	
286	16...3...34	2·1	19·81	17·54	0·36	88·50	2·04	1 06	
			Coimbatore. Co. 352.						
			March 1933.						
265	15...12...33	2·10	16·77	13·80	1·23	82·30	8·97	0 94	J. B.
345	23...2...34	2·35	20·12	18·01	0·31	89·52	1·70	1 04	J. B.
275	14...12...33	1·65	20·54	18·09	0·10	88·06	0·54	0·96	M. B.
274	13...12...33	2·10	19·24	16·65	0·39	86·54	2·32	0·88	M. B.
356	6...3...34	2·64	20·39	18·40	0·23	88·96	1·26	0·87	M. B.
			April 1933.						
245	15...12...33	1·95	19·20	16·83	0·66	87·64	3·94	0·88	
321	8...3...34	2·19	22·43	20·60	Trace.	91·85	...	0·94	
			May 1933.						
207	15...12...33	1·33	16·69	13·87	1·02	83·05	7·35	...	
292	9...3...31	2 00	20·49	17·55	0·15	85·65	0·88	...	
			June 1933.						
262	10...3...34	1·61	20·89	19·13	0·20	91·56	1·02	0·91	
			July 1933.						
234	12...3...34	1·10	18·51	15·99	0·46	86·4	2·90	0·87	
			August 1933.						
204	13...3...34	0·85	16·75	14·04	0·67	83·81	4·76	0·74	

TABLE I (*Continued*).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Co. 352. Adutlıurai.					
			September 1932.					
271	14—6—33	0·69	11·8	7·5	2·1	63·6	27·70	0·77
334	16—8—33	1·50	17·3	14·7	0·4	84·7	2·73	0 88
			October 1932.					
243	15—6—33	0·62	15·3	11·8	1·00	77·4	8·47	0·80
305	16—8—33	0·58	19·6	17·4	0·12	89·0	0·70	0·91
			November 1932.					
212	16—6—33	0·44	14·9	11·3	0·98	75·9		0·79
274	17—8—33	0 34	18·1	15·6	0·15	86 1		0·88
329	12—10—33	0·48	18·9	16·9	0·08	89·5		0·90
			December 1932.					
244	17—8—33	0·62	19·5	17·2	...	88·3		0·90
299	12—10—33	0·62	19·0	16·9	0·09	88·8		0·89
360	11—12—33	0·61	16·8	12·1	1·95	71·9		0 83
			January 1933.					
268	12—10—33	1·12	18·9	16·2	0·24	85·8		0·84
330	11—12—33	0·81	19·4	16·5	0·12	84 9		0 97
			February 1933 .					
237	13—10—33	1·62	19·1	16·6	0·31	86 9		0·87
299	12—12—33	1·36	21·1	19·4	0·08	91·6		0·95
			March 1933.					
209	13—10—33	1·43	16·8	14·4	0·41	85·5		0 84
269	12—12—33	1·13	20·3	18·0	0·13	88·6		0·98
344	...		No material for analysis.					
			April 1933.					
239	13—12—33	2·21	20·3	17·8	0·21	87·84		0·93
311	25—2—34	1·81	19·4	17·2	0·18	88·9		1·00
333	17—3—34	2·37	18·2	16·3	0·16	89·4		1·04
			May 1933.					
210	13—12—33	1·87	18·6	15·6	0·58	84·2		0·93
283	25—2—34	1·36	20·4	18·3	0·20	89·9		1·03
305	17—3—34	1·86	19·7	17·6	0 15	89·5		1·11
			June 1933.					
252	26—2—34	1·53	19·6	17·4	0·18	88·8	1·00	1·00
274	18—3—34	1·49	20·1	17·9	0·11	89·2	0·61	1 03
			July 1933.					
222	26—2—34	1·18	20·2	18·1	0·27	89·6	1·50	0·97
245	19—3—34	0·88	19·3	16·9	0·22	88·0	1·31	0·97
			Co. 351. Palur.					
			September 1932.					
242	15...5.. 33	0·97	12·3	8·6	2·5	70·0		0·85
277	19...6...33	1·65	14·2	10·7	2·4	75·4		0·91
331	12...8...33	2·15	16·4	13·4	1·1	81·7		0·96
			October 1932.					
246	20...6...33	0·80	11·6	7·6	2·8	64·6		0·89
300	13...8...33	1·25	15·3	11·7	2·2	76·5		0·96

TABLE I (*Continued*).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			November 1932.					
215	21—6—33	0·79	11·9	7·2	3.3	60·5		0·89
269	13—8—33	1·59	17·0	13·8	1·5	81·3		1·00
325	9—10—33	1·55	17 5	14·8	1·2	84·9		0·94
			December 1932.					
242	14—8—33	1·25	16·4	13·4	1·4	81·4		0·95
299	10—10—33	1·13	16·8	13·7	0·9	81·9		0·96
			Co. 352. Palur.					
			September 1932.					
242	15—5—33	1·37	11·2	7·7	3·1	68·5		0·93
277	19—6—33	2·00	12 6	9·0	2·3	71·7		0·95
331	12—8—33	2·05	14·7	12·0	1·3	81·7		1·00
			October 1932.					
246	20—6—33	1·20	10·8	6·8	3·1	63·0		0·93
300	13—8—33	1·93	14·8	11·4	1·6	77·2		0·95
			November 1932.					
215	21—6—33	0·91	11·9	7·5	2·9	62·8		0·93
269	13—8—33	1·20	15·8	12·7	1·6	80·5		0·92
329	9—10—33	1·60	16·2	13·5	0 9	83·7		0·92
			December 1932.					
242	14—8—33	1·20	14·5	11·0	1·7	75·6		1·00
298	9—10—33	1·18	17·0	14·4	0·5	84·8		0·98
			January 1933.					
210	14—8—33	1·24	16·27	13·2	1·1	81·1		0·92
266	10—10—33	1·60	17·36	15·1	0·5	85·7		0·99
365	17—1—34	1·65	15·41	13·0	0·5	84·3		0·95
			February 1933.					
236	10—10—33	1·50	16·51	13·9	1·1	84·2	7·98	0·84
337	18—1—34	1·73	17·6	16·0	0·4	90·7	2·25	1·00
363	14—2—34	1·60	17·1	15·3	0·4	89·5	2·65	1·06
			March 1933.					
208	10—10—33	1·48	14·0	10·4	1·7	74·6	16·57	0·81
306	18—1—34	1·48	16·8	14·7	0·8	87 5	5·34	0·97
336	15—2—34	1·33	16·2	14·2	0·8	87·7	5·50	1 03
			April 1933.					
277	19—1—34	1·45	15·1	12·5	1·6	82·9	12·55	0·94
304	15—2—34	2·15	15·2	12·7	1·2	83·4	9 51	0·97
333	12—3—34	1·68	16·7	14·2	1·1	85·2	8·02	0 98
			May 1933.					
247	19—1—34	1·73	14·3	11·6	2·4	81·3	20·45	0·96
274	16—2—34	1·53	14·8	11·8	1·7	79·8	14·24	1·06
303	12—3—34	1·05	17·7	15·3	0·9	86·5	5·86	0·98
			June 1933.					
215	19—1—34	1·15	12·7	9·4	2·4	74·4	25·2	0·90
243	16—2—34	0·78	16·4	14·0	1·0	85·3	6·9	1·01
274	13—3—34	1·30	17·6	15·0	1·0	84·8	6·8	1·02
343	26—5—34	1·05	15·3	12·2	1·35	80·2	11·0	0·92
			July 1933.					
244	13—3—34	0·75	19·3	17·1	0·4	88·6	2·5	1·01
312	26—5—34	0·98	15 0	12·7	1·0	84·7	8 1	0·87

Table II.

Comparative studies of crops of approximately equal ages irrespective of the time of planting.

Co. 352.

Station.	Date of planting.	Date of analysis.	Weight of a cane in lbs.	Brix.	Coefficient of purity.	Top/Bottom ratio.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		(210–220 days old).				
Anakapalle	2...9...32	31—3—33	1·9	15·7	79·7	0·80
	1—10—32	30—4—33	1·6	15 0	72·2	0·78
	1—12—32	8—7—33	1·1	12 8	71·7	0 95
Palur	18—11—32	21—6—43	0·9	11·9	62·8	0·93
	17—1—33	14—8—33	1·2	16·3	81·1	0·92
	16—3—33	10—10—33	1·5	14·0	74·6	0·81
	17—6—33	19—1—34	1·2	12·7	74·4	0·90
Aduturai	16—11—32	16—6—33	0·4	14·9	75·9	0·79
	17—3...33	13—10—33	1·4	16·8	85·5	0·84
	17—5—33	13—12—33	1·9	18 6	84·2	0·73
	18—7—33	26—2—34	1·2	20·2	89·6	0·97
Coimbatore	22—5—33	15—12—33	1·3	16·7	83·1	0·87
	22—8—33	13—3—34	0·9	16 8	83·8	0·74
Samalkot	14—11—32	23—6—33	1·0	14·0	77·3	0·83
		(235–245 days old).				
Anakapalle	2—9—32	30 – 4 – 33	2·30	16·1	79·43	0·79
	5—11—32	8 – 7 – 33	1·20	13·2	73·30	0·80
Palur	15—9—32	15 – 5 – 33	1·37	11·2	68·5	0·93
	17—10—32	20 – 6 – 33	0·80	11·6	64·6	0·89
	15—12—32	14 – 8 – 33	1·20	14·5	75·6	1·00
	16—2—33	10 – 10 – 33	1·50	16·5	84·2	0 84
	17—5—33	19 – 1 – 34	1 73	14·3	81·3	0·96
	17—6—33	16 – 2 – 34	0 78	16·4	85·3	1·01
	17—7—33	13 – 3 – 34	0·78	19 3	88·6	1·01
Aduturai	15—10—32	15 – 6 – 33	0·60	15·3	77·4	0 80
	16—12—32	17 – 8 – 33	0·60	19 5	88 3	0·90
	17—2—33	13 – 10 – 33	1·60	19·1	86·9	0·87
	17—4—33	13 – 12 – 33	2·20	20·3	87·8	0·93
	18—7—33	19 – 3 – 34	0·90	19·3	88·0	0·97
Coimbatore	14—4—33	15 – 12 – 33	2·00	19 2	87·6	0·88
	22 – 7 – 33	12 – 3 – 33	1·10	18·5	86·4	0·87
Samalkot	8 – 12 – 32	7 – 8 – 33	1·90	14·4	77·6	0·83
	12 – 4 – 33	12 – 12 – 33	2·00	16·4	83·6	0·99
	16 – 7 – 33	14 – 3 – 34	1·00	21·9	89·6	0·96
Maruteru	10 – 5 – 33	11 – 1 – 34	1·60	19·0	87·9	1·00
		(250–265 days old).				
Anakapalle	2 – 9 – 32	13 – 5 – 33	2·40	15·7	85·6	0·84
	1 – 5 – 33	22 – 1 – 34	1·30	19·0	88·8	1·02
Aduturai	18 – 6 – 33	26 – 2 – 34	1·50	19·6	88·8	1·06
Coimbatore	15 – 3 – 33	5 – 12 – 33	1·40	17·0	82·3	0·83
	22 – 6 – 33	10 – 3 – 34	1·60	20 9	91·6	0 91
Samalkot	12 – 10 – 32	23 – 6 – 33	1·10	14·2	84·6	0·83
	5 – 33	29 – 1 – 34	1·70	19·3	88·0	1·00
		(266–275 days old).				
Anakapalle	1 – 3 – 33	29 – 11 – 33	1·50	15·80	86·7	0·97
	1 – 4 – 33	28 – 12 – 33	1·30	14·70	84·7	1·01

TABLE II (*Continued*).

(1)	(2)	(3)	(4)	(5)	(6).	(7)
Palur	15—9—32	19—6—33	2·00	12·56	71·7	0·95
	18—11—32	13—8—33	1·20	15·80	80·5	0·92
	17—3—33	10—10—33	1·60	17·60	85·7	0·99
	17—5—33	16—2—34	1·53	14·80	79·8	1·06
	17—6—33	13—3—84	1·30	17·60	84·8	1·02
Aduturai	16—9—32	14—6—33	0·70	11·80	63·6	0·77
	17—1—33	12—10—33	1·10	18·90	85·8	0·84
	17—3—33	12—12—33	1·10	20·3	88·6	0·98
	18—6—33	18—3—34	1·49	20·1	89·2	1·03
Coimbatore	15—3—33	14—12—33	1·70	19·7	88·3	0·87
Samalkot	14—11—33	8—8—33	1·60	15·1	71·6	0·76
	11—1—33	11—10—33	1·98	15·2	76·4	0·91
	10—3—33	13—12—33	2·80	16·9	80·9	1·08
Maruteru	12—4—33	11—1—34	1·60	18·7	85·6	1·04
		(276–285 days old).				
Anakapalle	1—10—32	8—7—83	1·70	12·80	78·3	0·86
	1—7—33	11—4—34	0·95	21·30	90·2	0·88
Palur	15—9—32	19—6—33	2·00	12·60	71·7	0·95
	17—4—33	19—1—34	1·50	15·10	82·9	0·94
Aduturai	17—5—33	25—2—34	1·40	20·40	89·9	1·03
Samalkot	9—9—32	22—6—33	2·78	17·40	84·2	0·84
	10—3—33	13—12—33	2·77	16·90	80·9	1·08
	18—6—33	13—3—34	1·32	21·40	89·7	0·87
Maruteru	20—9—32	28—6—33	2·08	13·85	71·5	0·84
	20—3—33	23—12—33	2·70	17·90	86·0	1·02
(wet)	5—6—33	17—3—34	1·30	19·50	87·1	1·05
(dry)	3—6—33	16—3—34	2·10	19 8	88 6	1·06
		(286–296 days old).				
Anakapalle	1 - 4 - 33	21 - 1 - 34	1·02	18·0	86·1	1·05
	1 - 5 - 33	21 - 2 - 34	1·47	20·6	89·3	1·04
Coimbatore	22 - 5 - 34	9 - 3 - 34	2·00	25·5	85·7	0·93
Samalkot	12 - 4 - 33	27 - 1 - 34	2·17	19·51	89·60	1·08
Maruteru	20 - 3 - 33	10 - 1 - 34	2·30	19·12	87·40	1·04
		(297–307 days old).				
Anakapalle	1 - 12 - 32	4 - 10 - 33	1·90	14·4	77·7	0·89
	2 - 2 - 33	28 - 11 - 33	1 50	16·5	91 9	1·02
	1 - 3 - 33	27 - 12 - 33	1 38	17·6	87·0	1·03
	1 - 4 - 33	21 - 1 - 34	1·02	18 0	86·1	1·05
	1 - 5 - 33	21 - 2 - 34	1·47	20·6	89·3	1·04
Samalkot	13 - 10 - 32	8 - 8 - 33	1·78	16·60	77·90	0·83
	8 - 12 - 32	10 - 10 - 33	2·30	16·20	76·70	1·13
	6 - 2 - 33	12 - 12 - 33	2·50	17·90	84·30	1·00
	12 - 4 - 33	27 - 1 - 34	2·50	19 20	84·00	1·08
	- 5 - 33	13 - 3 - 34	2·00	20·70	90·80	1·02
Aduturai	15 - 10 - 32	10 - 8 - 33	0·60	19·60	89·00	0·91
	16 - 12 - 33	12 - 10 - 33	0·60	19·00	88·80	0 89
	17 - 2 - 33	12 - 12 - 33	1·00	21·10	91·60	0 95
	17 - 5 - 33	17 - 3 - 34	1·90	19·70	89·50	1·11
Palur	17 - 10 - 32	13 - 8 - 33	1 90	14 80	77·2	0·95
	15 - 12 - 32	9 - 10 - 33	1·20	17·00	84 8	0·98
	16 - 3 - 33	13 - 1 - 34	1·50	16 80	87·5	0·97
	17 - 4 - 33	15 - 2 - 34	2 20	15·20	83·4	0·97
	17 - 5 - 33	12 - 3 - 34	1·05	17·70	86·5	0·98

TABLE II (*Continued*).

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Maruteru	21—2—33	21—12—33	2·00	17·40	90·80	0·94
	20—3—33	10—1—34	2·30	19·10	85·37	1·04
	10—5—33	15—3—34	1·80	22·80	87·36	1·00
		(*308–318 days old*).				
Anakapalle	2—9—32	8—7—33	3·10	13·50	80·70	0·96
	1—6—33	10—4—34	1·30	22·2	89·50	1·05
Aduturai	17—4—33	25—2—34	1·80	19·40	88·92	1·00
Samalkot	6—2—33	12—12—33	2·50	17·90	84·30	1·00
Maruteru	10—5—33	15—3—34	1·80	22·80	89·00	1·00
	19—8—32	28—6—33	2·00	13·50	73·60	0·86
		(*319–330 days old*).				
Anakapalle	3—1—33	27—11—33	1·10	16·36	89·70	0·99
	2—2—33	27—12—33	1·40	17·24	87 60	1·05
	1—3—33	21—1—34	1·60	18·94	91·60	1·04
	1—4—33	21—2—34	1·70	20 58	90·00	1·09
Aduturai	16—11—32	12—10—33	0·50	18·94	89·50	0·90
	17—1—33	11—12—33	0·80	19·41	84·90	0·97
Samalkot	14—11—32	9—10—33	...	18·70	82·90	0·89
	10—3—33	26—1—34	2·90	20·00	89·10	1 01
Maruteru	21—1—33	8—1—34	2·40	18·00	86·30	0·97
Coimbatore	14—4—33	8—3—34	2·19	22·40	91·85	0·94
Palur	18—11—32	9—10—33	1·60	16·20	83·70	0·92
		(*331–340 days old*).				
Anakapalle	5—11—32	4—10—33	2·00	14·10	71·30	0·90
Samalkot	9—9—32	7—8—33	2 80	19·40	79·40	0·95
	11—1—33	11—12—33	2·50	19·30	87·70	0·98
	12—4—33	15—3—34	2·30	23·20	...	1 03
Maruteru	22—1—33	20—12—33	2·20	18·70	83·80	0·97
	12—4—33	18—3—34	2·30	20·50	87·00	1·02
Aduturai	16—9—32	16—8—33	1·50	17·30	84·70	0 88
	17—4—33	17—3—34	2·40	18·20	89·40	1·04
Palur	15 - 9 - 32	12 - 8 - 33	2·00	14·70	81·70	1·00
	16 - 2 - 33	18 - 1 - 34	1·70	17·60	90·70	1·00
	16 - 3 - 33	15 - 2 - 34	1·30	16·20	87 70	1·03
		(*341–350 days old*).				
Anakapalle	1 - 5 - 33	10 - 4 - 34	1·50	21·17	89·80	1·09
Coimbatore	15 - 3 - 33	23 - 2 - 34	2·40	20·12	89·52	1·04
		(*351–360 days old*).				
Anakapalle	3 - 1 - 33	26 - 12 - 33	1·30	17·60	89·7	1·03
	2 - 2 - 33	20 - 1 - 34	1·60	19 80	91·3	1·05
	1 - 3 - 33	20 - 2 - 34	1·40	19·60	87·48	1·05
Samalkot	13 - 10 - 32	7 - 10 - 33	2·00	20·80	85·10	0·92
	6 - 2 - 33	25 - 1 - 34	2·50	21·00	97·20	1·05
Maruteru	22 - 1 - 33	12 - 1 - 34	1·80	19·60	89·30	1·02
Coimbatore	15 - 3 - 33	6 - 3 - 34	2·60	20·40	89·00	0·97
Aduturai	16 - 12 - 32	11 - 12 - 33	0·61	16·80	71·90	0·83
		(*361–370 days old*).				
Anakapalle	1 - 10 - 32	4 - 10 - 33	3·23	13 50	68·4	0·93
	1 - 12 - 32	27 - 11 - 33	2·20	16·50	93·4	1·04
Maruteru	20 - 3—33	19 - 3 - 34	2·30	19·74	86·08	1·05

TABLE II (*Continued*).

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Palur	17 – 1 – 33	17 – 1 – 34	1·65	15·40	84·30	0·95
	6 – 2 – 33	14 – 2 – 34	1·60	17·10	89·50	1·06
		(*371–380 days old*).				
Anakapalle	1–4–33	9–4–34	1·54	21·00	90·20	1·05
		(*381–390 days old*).				
Anakapalle	5 - 11 - 32	28 - 11 - 33	2·00	15·56	89·90	1·02
	1 - 12 - 32	26 - 12 - 33	2·20	18·80	90·07	0·98
	3 - 1 - 33	20 - 1 - 34	1·35	19·30	91·40	1·02
	2 - 2 - 33	20 - 2 - 34	1·52	20 55	87·30	1·07
Maruteru	20 - 9 - 32	13 – 10 – 33	3·90	18·20	90·50	0·99
		(*391–400 days old*).				
Anakapalle	2 - 9 - 32	4 - 10 - 33	3·55	13·20	70·20	1·14
	1 - 3 - 33	9 - 4 - 34	1·53	22·20	90·10	1·08
Samalkot	9 - 9 - 32	6 - 10 - 33	3·15	17·00	82·70	1 05
Maruteru	19 - 8 - 32	12 - 10 - 33	3·00	18·08	86·16	1·05
		(*less than 200 days old*).				
Anakapalle	2 - 9 - 32	10 . 2 - 33	1·02	13 40	64·90	0·79
	1 - 10 - 32	31 - 3 - 33	1·05	12·30	63·00	0·71
Samalkot	8 - 12 - 32	24 - 6 - 33	1·30	12·80	68·20	0·87

Research Note

A new and important weed host of the cotton stem weevil (*Pempheres affinis F.*)

In the course of an intensive field study of the alternative food plants of the weevil, various species belonging to Malvaceae, Tiliaceae and allied orders were collected and examined. A few among them such as *hibiscus vitifoleus sida spinosus corchorus olitorus* were noted to harbour a small but varying proportion of weevil stages. But the highest infestation was observed in a hitherto unrecorded weed host *malvastrum coromandelianum* (Garcke). This weed is widely distributed and abundant on all wastelands, sometimes also associated with cultivated crops, in borders of fields, along road sides, tank bunds, sides of water channels, fences and other neglected places.

The younger plants were generally free and not attacked while the majority of the medium sized and large ones were infested. The mode of attack of the weevil is approximately similar to that in cotton. The nature of the injury and the character and course of the tunnels are also roughly similar. In a small number of cases galls are also produced. As many as three galls have been noted to be developed in the same plant. A small percentage of mortality is also seen to be caused among such plants. A maximum of nine attacks with six live grubs of varying stages has been noted in a single plant. The following table presents the data obtained in regard to the weevil population in the different lots of this plant material.

Total No. of plants examined.	% of attacked plants.	Total number of live stages.				Emergence apertures.	Mere infestations	No. of infestations per 100 plants.	No. of live stages per 100 plants.
		Larva.	Prepupa.	Pupa.	Adult.				
558	42	116	9	2	7	14	154	54	24

In view of its abundance and intense susceptibility to weevil infestation (with a maximum of 65%), *Malvastrum coromandelianum* appears to be in certain seasons, the foremost weed host of the cotton stem weevil capable of maintaining fairly large populations in the absence of cotton. The importance of such offseasonal hosts is all the greater because the pest populations even in country cottons during this part of the season are seen to be rather insignificant. Further studies in this line are in progress.

I am thankful to fieldman Royappan for the collection of host plants.

Cotton breeding Station,
3—10—'36.

P. N. Krishna Iyer,
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Agricultural Notes.

1. In the costal tracts of Tekkali taluk, Vizagpatam district, where the villagers are able to get fuel from various topes, and where the soils are in bad need of manuring, ryots do not at all waste cattle dung by using it as fuel, but add every bit of it to their fields after careful conservation. Soils are frequently spread over the floor of the cattle sheds for catching cattle urine; and the urinary earth, dung and litter are carefully conserved in pits with great care. It is refreshing to note in this tract where Departmental propaganda was not undertaken till recently the practices in the conservation of cattle manure have been developed to a high degree of perfection. Possibly the availability of fuel, and the hungry nature of the soils requiring manuring are responsible for the adoption of these commendable practices that are proving uphill tasks in other areas.

2. Erythrina (*Erythrina indica*) is the popular hedge plant round each holding as it supplies not only the necessary standards to each cultivator, but also timber for boat building. It is claimed that unlike other trees Erythrina does not affect the neighbouring crops and can conveniently be planted wherever props for fences are required. In places where white-ant attack is so serious as not to allow any posts in tact even for few months, the introduction of Erythrina standards by raising nurseries in the beginning, if necessary, may be encouraged. Its seeds can be got in the tract for mere asking.

3. With the annual depredation of Red Hairy Caterpillar (*Amsacta albistriga*) the villagers in the tract had emigrated largely to Burma. The members left at home find it difficult to cultivate the fields far away. Only the fertile plots adjoining the villages are cropped. The others are being gradually planted with cashewnut, which is not only proving to be a profitable hardy fruit tree for the poor soils, but also is free from the caterpillar pest. This practice can be copied by farmers of other tracts where similar conditions prevail.

4. The introduction of cashew nut did not prove to be an unmixed blessing as the poor patches of fields planted with them affect the neighbouring plots by the spreading roots of cashew. To overcome this, ryots dig deep trenches along sides of fields as is done on Government Farms for experimental plots, and these trenches serve also to trap *Amsacta* caterpillars during the period of their ravages.

5. It is our common experience that filling up gaps in live hedges with any live plant material is difficult, but in the above tract *Pandanus* is freely made use of. The stems when closely planted in the gap immediately serve as barrier and take root quickly. The live fences round each holding support vegetable creepers of bittergourd and *Agakara* (a variety of bitter gourd), by the sale of which a fair income is derived. These creepers are almost of perennial nature—bitter gourd continuing from year to year with self sown seed, and *Agakara* with underground stems.

6. It was found in parts of Tekkali taluk that the Red Hairy Caterpillar (*Amsacta albistriga*) establishes itself as a sort of indigenous pest on some of the mountain sides with *Canthium paraviflorum* (Tel:— Balusu) shrubs as host, but its presence is not felt in the neighbouring cultivated dry areas since these areas support only ragi crop, the planting of which commences after the hairy caterpillars are full grown and about to pupate. Thus agriculture and pest in these areas have mutual adjustment without any positive interference with one another and is worth copying in other places with similar conditions.

V. Tirumal Rao,
Entomology Assistant, Samalkota

ABSTRACTS

The Indian Coffee Cess Committee. Under the Indian Coffee Cess Act No. XIV of 1935 has been created a fund derived from the levy of a customs duty of 8 annas per cwt. on all coffee produced in India and taken by sea or by land to any place beyond the limits of British India or Burma. During the year the cess receipts which amounted to over a lakh were actually far more than the estimated amount which was only about Rs. 85,000 per annum. The coffee cess committee is so constituted that the three main interests. the grower, the trader and agricultural expert are directly represented in it. It is composed of a representative from each of the local departments of agriculture of Mysore, Travancore and Cochin, a representative for each of the curing, manufacturing and shipping interests, and eleven representatives for coffee growers, of whom Mysore being the premier coffee growing area, has been given the right to send three. In addition, the Imperial Council of Agricultural Research sends a representative to the Committee.

The activities of the committee have been directed along many lines ; a coffee marketing survey to collect data relating to the transport, sale, consumption etc. of coffee, the establishment in co-operation with the High Commissioner of an Indian coffee market Expansion Board in London, with the main object of explaining the possibilities of expanding the market for Indian coffee in the United Kingdom and on the Continent, and the launching of a 'Drink Indian coffee' campaign in India itself, are the outstanding achievements of the committee. The last mentioned campaign has included many methods of coffee publicity propaganda, like the employment of attractively dressed waiters to serve coffee in coffee houses, the display of posters and menu cards, the pressing into service of cinemas and newspapers; and for the future is programmed even a demonstration truck.

The committee has also paid attention to the question of adulteration of coffee and have besides made a strong representation to the Government that preference granted to Indian coffee in the United Kingdom be increased from 1 d. to 3 d. per lb.

The committee have opened a Central Information Bureau at Bombay and serious attempts are being made to collect all available data and statistics on the subject.

(Summarised from a leaflet No. 1, October 1936 of the Indian coffee cess committee). M. R. B.

The absorption of nutrients by two varieties of wheat grown on the black and gray soils of Alberta. By E. K. Woodford and A. G. McCalla. Chemical analyses carried out at five stages of development of Reward and Red Bobs wheat grown on the black and the gray soils of Alberta showed that differences in soil and variety significantly influenced the composition of the plants.

The weights of dry matter and all nutrients studied were higher for the black soil plants.

On the basis of percentage of dry matter, all nutrients, except phosphorus, were higher in the black-soil plants. Reward was higher than Red Bobs in nitrogen when grown on the black soil ; and in ash, phosphorus and potassium when grown on the gray soil.

The grain of gray-soil plants was higher in all ash constituents but lower in nitrogen. Varietal differences were more marked in the grain and straw of the mature plants, Reward grain grown on both soils being higher in nitrogen, ash, phosphorus and magnesium.

The total weights percentages, rates of absorption and ion ratios all indicated that nitrogen and sulphur were limiting the growth of wheat on the gray soil. It is suggested that the proportionately higher absorption of phosphorus from the soil was in compensation for the low availabilty of nitrogen and sulphur.

The differences in original quality of the wheats grown on the two soils can be largely accounted for by the differences in protein content, and therefore nitrogen supply. Phosphorus absorption, nitrogen, phosphorus and sulphur balance, and the relation of ash to protein, are possibly important in determining the keeping properties of the flour. Author's abstract.

[Possibly such differences in the composition are responsible for the smaller damage done by the insects to the trees on the black soils. —Ed.]

Gleanings.

Potatoes: Acceleration of Sprouting. Farmers who grow potatoes under irrigation for the early market during the winter often have difficulty in securing sprouted "seed" for planting or inducing their own "seed" to sprout sufficiently early. Some growers of main crop potatoes, too, who prefer to use "seed" grown under irrigation in winter have a similar difficulty. A solution of this problem has been tested at the Agricultural Experimental Station, Salisbury, during experiments on fumigating potatoes with carbon bisulphide to kill "tuber moth".

The tubers should be placed in an air tight room or receptacle, such as a corrugated iron tank. A pit in the ground covered with a tarpaulin has not proved satisfactory, probably owing to the vapour being absorbed by the earth. On the otherhand a tarpaulin covering to an iron tank would be satisfactory, since the vapour is 2·6 times heavier than air, and so will not tend to rise and find its way through the tarpaulin.

Carbon bisulphide should be placed in shallow trays or dishes on the top of the "seed" tubers and the room or receptacle closed. The liquid evaporates readily on a warm day and the vapour being heavier than air, flows over the sides of the trays and fills the receptacle. It is advisable to commence the treatment on a warm morning, so that the liquid will evaporate rapidly. The tubers should undergo the treatment for 24 to 48 hours, and two tablespoonfuls of the carbon bisulphide are required to each cubic yard, or 27 cubic feet of volume of the receptacle, irrespective of whether the latter is filled with tubers or only partly so. Within ten days about 75 % of the "seed" would be commencing to sprout. When sprouting has commenced, it may be further accelerated by placing the tubers in a gently warmed tobacco barn or in a warm room, in which the air is kept reasonably moist. It is useful to know that carbon bisulphide is sold by the pound weight. One pound is equivalent to approximately 13 ounces (liquid measure) or 26 tablespoonfuls. *Rhodesia Agricultural Journal* Vol. 33 pp. 378.

Review.

The Bulletin of the Imperial Institute, London, has now been enlarged to give a more complete reflection of the various activities of the Institute. The Bulletin contains interesting results of laboratory investigations as well as useful articles and notes on plant and animal products, and on ores and minerals. The last two issues contain, among many others, notes on drying of hides and skins; improvement in the quality of ghee; cultivation of Tung oil tree; Cacao fermentation; weed-killers; cultivation of lemon-grass and distillation of its oil; colouration of glass by mineral compounds; mineral resources of Johore, British Somaliland and Abyssinia; Empire nickel developments; the Dead Sea potash industry; and magnesium compounds from sea water. The Institute is to be congratulated on the reduction of the price of the Bulletin, which it has been able to make in spite of the extended scope of its contents. J. S. P.

Crop & Trade Reports.

Receipt of raw cotton at Press and Spinning Mills.

Total cotton pressed and unpressed.

	Bales of 400 lbs. against an estimate of 540,700 bales for 1935-36.	Figures for corresponding period in previous years.
1-2-36 to 16-10-36	557,708	411,591
,, 23-10-36	563,572	415,926
,, 30-10-26	570,480	420,325
,, 6-11-36	574,397	423,826
,, 13-11-36	582,532	428,217

	Cotton bales received at mills.	Export by sea.	Import by sea.
1-2-36 to 16-10-36	335,774	220,362	94,628
,, 23-10-36	341,555	223,869	94,743
,, 30-10-36	350,000	230,043	94,949
,, 6-11-36	354,780	232,503	95,451
,, 13-11-36	361,259	236,456	95,511

Cotton—Intermediate Report 1936--37. In parts of the Central districts and the South, the sowings of cotton are still in progress. The area under the crop is expected to be normal. The condition of the young crop is generally fair.

2. In the Deccan, the sowings of *hingari* or late cotton have concluded and are expected to be above normal in the districts of Bellary and Anantapur on account of the failure of rains in the mungari season and the consequent restricted sowings. The yield from mungari or early cotton is expected to be generally below normal. In parts of Guntur, the Cocanadas, cotton has been affected by the cyclone on the 28th October 1936.

3. The local cotton trade is not generally active at this time of the year. The wholesale price of cotton lint per imperial maund of 82-2/7 lb. as reported. from important markets towards the close of October 1936 was Rs. 19-9-0 for Cocanada, Rs. 25-11-9 for Red Northerns, Rs. 18-11-0 for Westerns. Rs. 24-14-0 for Cambodia, Rs. 24-5-0 for Coimbatore Karunganni, Rs. 23-2-0 for Tinnevelly Karunganni, Rs. 22-4-0 for Tinnevellies and Rs 21-4-0 for Nadam cotton As compared with the prices in the previous month, the prices of Red Northerns reveal a rise of about 9 per cent. while those of the other varieties are practically stationary.

Paddy—Intermediate Report 1936—37. The harvest of first crop paddy has either concluded or is concluding in parts of the Central districts, the South and the West Coast. The yield is reported to be generally normal. The crop is reported to have been affected to some extent by drought in parts of Kistna, Anantapur, Chingleput and South Arcot and by the attack of insects in parts of East Godavari, West Godavari, Salem and Malabar. The severe cyclone of the 28th October has lodged the crop in parts of Kistna and Guntur. The condition of the crop is reported to be generally satisfactory in the other districts.

2. The wholesale price of paddy per imperial maund of 82-2/7 lbs. as reported from important markets towards the close of October was Rs. 2 - 14 - 0 in Vizianagaram and Cuddapah, Rs. 2 - 12 - 0 in Madura, Rs. 2 - 11 - 0 in Salem, Rs. 2 - 10 - 0 in Nellore, Rs. 2 - 6 - 0 in Vellore and Erode, Rs. 2 - 5 - 0 in Nandyal, Rs. 2 - 4 - 0 in Guntur, Rs. 1 - 15 - 0 in Cocanada and Tinnevelly, Rs. 1 - 13 - 0 in Kumbakonam, Rs. 1 - 12 - 0 in Negapatam and ranged from Rs. 2 - 2 - 0 to Rs. 2 - 3 - 0 in the other markets. As compared with the prices reported for September 1936, the prices are stationary in Vizianagaram, Masulipatam, Guntur, Nandyal, Vellore, Salem, Trichinopoly and Kumbakonam while they reveal a rise of 3 per cent. in Madura and a fall of 2 to 5 per cent. in the other markets.

Sugarcane—Intermediate report. 1936-37. The cyclone of the 28th October 1936 lodged the sugarcane crop in parts of the districts of Kistna and Guntur. In the North Arcot District, the crop suffered to some extent from drought. The condition of the crop is satisfactory in the other districts and the yield is expected to be normal if the season continues to be favourable.

2. The wholesale price of jaggery per imperial maund of 82-2/7 lb. as reported from important markets towards the close of October 1936 was Rs. 6-1-0 in Adoni, Rs. 5-12-0 in Madura, Rs. 5-5-0 in Nandyal, Rs. 5 in Mangalore, Rs. 4-15-0 in Bezwada, Rs. 4-12-0 in Masulipatam, Guntur and Tuticorin, Rs. 4-10-0 in Kumbakonam, Rs. 4-7-0 in Calicut, Rs. 4-5-0 in Rajahmundry, Rs. 4-4-0 in Ellore, Rs. 4-1-0 in Coimbatore, Rs. 3-13-0 in Cocanada and Salem, Rs. 3-11-0 in Bellary and Cuddapah, Rs 3-2-0 in Vellore Rs. 3 in Vizagapatam, Rs. 2-15-0 in Trichinopoly and Rs. 2-8-0 in Tinnevelly. As compared with the prices of the previous month, the prices reveal a rise of 12 per cent in Trichinopoly, 5 per cent in Mangalore, 4 per cent in Vizagapatam, 3 per cent in Masulipatam and Salem and 2 per cent in Cocanada and a fall of 14 per cent in Vellore, 11 per cent in Bellary, 4 per cent in Madura, 3 per cent in Nandyal and 1 per cent in Ellore whilst they remained stationary in the other centres.

Groundnut—Intermediate Report. 1936. The condition of the winter crop of groundnut is satisfactory in the Circars. Coimbatore, Ramnad, Tinnevelly and the West Coast. Elsewhere the crop has been affected by drought to some extent.

2. The wholesale price of groundnut (shelled) per imperial maund of 82-2/7 lbs. as reported from important markets towards the close of October 1936 was Rs. 6—4—0 in Coconada, Rs. 5—15—0 in Cuddalore, Rs. 5—9—0 in Guntur and Negapatam, Rs. 5—7—0 in Vizagapatam, Rs. 5—4—0 in Vizianagaram, Rs. 4—15—0 in Vellore, Rs. 4—14—0 in Cuddapah and Salem, Rs. 4—12—0 in Coimbatore, Rs. 4—9—0 in Nandyal, Rs. 4—8—0 in Adoni, Rs 4—6—0 in Madura, Rs. 4—4—0 in Ellore and Rs. 4—3—0 in Tinnevelly. As compared with the prices of the previous month, the prices are stationary in Negapatam and Tinnevelly, while they reveal a fall of 21 per cent in Nandyal, 18 per cent in Vizianagaram and Madura, 13 per cent in Vellore, 10 per cent in Guntur, 9 per cent in Adoni, 7 per cent in Vizagapatam, 5 per cent in Cuddapah, 4 per cent in Ellore and Coimbatore and 1 per cent in Cuddalore and a rise of 4 per cent in Cocanada and 3 per cent in Salem.

College News and Notes.

M. R. Ry. Rao Bahadur S. Sundararama Iyer, M. A., I, A. S. (One of our ex-Vice Presidents) retired from service on the 7th November. A tea was arranged in the Officers' Club in honour of his retirement.

Mr. K. M. Thomas one of our members who had been to England on study leave returned early this month and has been appointed to officiate as the Government Mycologist. We take this opportunity to congratulate him on his promotion.

The Director of Agriculture, Madras paid a visit early this month in connection with the supply of Siruvani water to the Estate.

Student's corner. Under the auspices of the Agricultural College Students' club a paper on "How to approach the Indian ryot with the message of modern Agriculture" was read by J. Gopal Rao of the final year with Dr. J. A. Muliyil, M. A., Ph. D. in the chair.

Football. The second match of the Abraham Memorial Football Tournament, was played between the college XI and the Government College High School in the Stadium grounds. The match ended in a defeat to our College by 3 goals to nil.

Hockey. The College was defeated by 5 goals to 1 by the Madras Forest College in a friendly match played on their grounds. In connection with the Inter-Collegiate Tournament, a match was played with the local Government Arts College when our team scored 11 goals against nil. The College also won in a match played against the Recruit School. The first match of the Y. M. C. A. Tourney played against the Papanaickanpalayam ended in a victory to the College by 2 goals to nil. The second match of the Y. M. C. A. Tourney played against the Stane's High School in the Forest College grounds had to be abandoned after the first half, owing to the intervention of rain. The Inter-Collegiate finals were played against the Alwaye Government College; our College won by 2 goals to nil.

Cricket. In a friendly match played against the Govt. College High School, our B. Team won by 17 runs. The High School team was out for 85 runs, the top scorer being Padmanaban (23 runs). The College players were able to pile up 102 runs. A match was played between the College team and Sivaganga Rajah's team. The visitors were out for 69 runs. Our team was skittled out for a paltry 46. Mr. Dinker Rao was in his full form and gathered 15 runs in a very short time, but unfortunately was run out. Mr. A V. Krishnaswami and Parthasarathy took 4 and 5 wickets respectively.

The students of the 3rd year after an interesting and happy tour returned on the morning of the 16th October.

Weather Review (OCTOBER 1936.)

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	14·7	+6·7	80·7	South	Negapatam	3·0	−7·5	20·0
	Berhampore *	6·7	−4·0	57·1		Aduthurai *	2·9	−5·2	20·3
	Calingapatam	7·8	−0·2	43·3		Madura	2·6	−5·2	20·9
	Vizagapatam	12·3	+5·2	35·8		Pamban	6·4	−2·6	14·1
	Anakapalli *	7·8	+0·8	36·7		Koilpatti *	3·6	−4·0	14·9
	Samalkota *	11·1	+2·5	54·5		Palamkottah	3·8	−3·0	18·7
	Maruteru *	8·6	+0·5	49·0					
	Cocanada	21·7	+13·8	62·6					
	Masulipatam	7·5	−0·6	42·7	West Coast	Trivandrum	5·2	−5·4	58·7
	Guntur *	12·2	+7·0	42·4		Cochin	4·6	−8·6	106·5
Ceded Dists.	Kurnool	1·6	−1·9	16·1		Calicut	4·0	−6·2	127·5
	Nandyal	2·1	−4·0	19·4		Pattambi *	...	...	...
	Hagari *	3·3	−0·3	18·3		Taliparamba *	5·7	−5·8	122·6
	Bellary	1·5	−2·4	13·9		Kasargode *	9·2	...	125·3
	Anantapur	1·5	−2·2	14·5		Nileshwar *	5·7	−4·4	134·0
	Rentachintala	...	...	...		Mangalore	10·0	+2·5	159·6
	Cuddapah	1·6	−3·4	14·5					
	Anantharaju-pet *	1·9	...	...	Mysore and Coorg	Chitaldrug	1·9	−2·3	15·5
						Bangalore	2·5	−3·2	28·3
Carnatic	Nellore	7·7	−0·7	20·0		Mysore	2·4	−3·9	34·4
	Madras	8·3	−3·4	27·9		Mercara	7·3	−1·4	152·4
	Palur *	2·6	−8·2	24·1					
	Tindivanam *	0·6	−8·6	17·4					
	Cuddalore	3·6	−7·4	21·3	Hills.	Kodaikanal	4·8	−4·9	47·8
Central	Vellore	1·4	−4·9	19·4		Coonoor *	12·7	...	56·4
	Salem	1·8	−4·9	34·8		Ootacamund *	6·0	−4·5	48·4
	Coimbatore	4·1	−2·3	17·4		Nanjanad *	4·6	−2·8	49·5
	Coimbatore Res. Inst. *	3·5	−2·2	15·6					
	Trichinopoly	1·6	−5·3	17·2					

* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1935 (published in Fort St. George Gazette).

The unsettled conditions in the North Bay of Bengal during the end of last month concentrated into a deep depression on the 1st of this month. In the course of the next two days it intensified into a cyclonic storm in the North-west angle of the bay. Passing rapidly north west wards it crossed the Orissa coast about 4th and lay as a deep depression over Chota Nagpur on the 5th. It then receded and travelling in a north easterly direction filled up over East Bengal on 7th.

In connection with the depression wide spread rain occured in Burma, coastal Bengal, Northeast India and along and near the track of the depression from 1st to 7th. Thunder storms were active in the West coast of the Peninsula during the first four days of the month and later in the Peninsula in general during the latter half of the month. Intermittent thunder showers were also reported in the interval, from Burma, Assam, North East India, Bombay, Deccan, North Madras coast, South east Madras and Malabar.

A depression formed in the South Bay of Bengal about 26th of the month midway between Ceylon and Andamans, intensified into cyclonic storm and lay centred 200 miles to South East of Madras on the morning of the 27th October. Later moving Northwards it crossed the Circars coast on 28th and lay as a depression over Hyderabad on 29th. Thereafter it moved to near Nagpur where it weakened and filled up by 31st. In association with this depression wide spread rain occurred in North Madras coast, Orissa and Central Provinces. It also tended to strengthen the North East monsoon which had begun to establish itself over the South Bay of Bengal during the latter half of the month.

The cyclonic storm accompanied by heavy rains according to newspaper reports has caused considerable damage to life and property in North Madras coast.

The month's rainfall was in large excess in the North Madras coast and in defect elsewhere in the Peninsula.

The skies were moderately to heavily clouded.

The chief amongst the heavy falling of rain were Cocanada 11·1" and Gopalpur 6·1" Cocanada 5·0" and Vizagapatam 3·9".

Weather Report for the Research Institute Observatory.

Report No. 10/36.

Absolute maximum in shade	...	92·0° F
Absolute minimum in shade	...	67·0° F
Mean maximum in shade	...	87·7° F
Departure from normal	...	-0·1° F
Mean minimum in shade	...	70·5° F
Departure from normal	...	+0·3° F
Total rainfall	...	3·51"
Departure from normal	...	-2·24"
Heaviest fall in 24 hours	...	0·98"
Total number of rainy days	...	10 days.
Mean daily wind velocity	...	14 M. P. H.
Mean humidity at 8 Hours	...	79·2%
Departure from normal	...	+0·3%

Summary : In association with thunder storms activity rain occurred on the first two days of the month and later in the second half of the month. The maximum temperature was almost normal. The minimum temperature and the Humidity were in slight excess by 0·3° and 0·3% respectively. The skies were moderately to heavily clouded.

Rainfall was in large defect.

Departmental Notifications.

Appointments. Mr. P. Krishnaswami, B. Sc., Ag., Fieldman, Millet Section, Coimbatore, is appointed to officiate as Assistant in the Millets Section in Category I class 1, Madras Agricultural Subordinate Service iii grade on Rs. 75 in one of the temporary posts sanctioned in G. O. No. 178 Dev. dated the 6th February 1936 and is posted to the Dry Farming Station, Hagari. Mr. P. Krishnaswami though appointed as temporary assistant in the Dry Farming Scheme, will be counted to be on probation against one of the newly sanctioned posts in the regular line (Agricultural Section) from the date of his joining duty as assistant.

Transfers. M. R. Ry. K. Ramanujacharya, Agricultural Demonstrator, Ongole, to be on special duty in connection with the opening of cattle farm—to report

himself for duty to Mr. R. W. Littlewood, special officer. M. R. Ry. D. C. Hanumantha Rao, Agricultural Demonstrator under training at Guntur—to officiate as Agricultural Demonstrator, Ongole Vice No 1. M. R. Ry. B. L. Narasimhamurthi, Assistant in Millets, Dry Farming Station, Hagari is transferred to Guntur to officiate as Assistant in Millets *Vice* Mr. T. Narayana Rao granted leave. M.R.Ry. L. Krishnan, Agricultural Demonstrator on relief from the viii circle, is posted to Tanjore sub circle. M. R. Ry. T. A. Rangaswami Iyengar, on relief by No. 1 is posted temporarily to Nannilam sub circle, as soon as an additional hand is posted to this division he must go to Arantangi. M. R. Ry. K. C. Thomas on return from leave will join duty as a temporary measure, as Agricultural Demonstrator, Gobi, and take charge of it from the Agricultural Demonstrator, Erode. M. R. Ry. T. K. Thangavelu, Agricultural Demonstrator, Vans, after handing over charge of the van to the Salem District will take charge of the Gobisun circle from M. R. Ry. K. C. Thomas. Orders regarding further posting of M. R Ry. K. C. Thomas will issue later on.

Leave. Principal's Section. M. R. Ry G. R. Venkatachalapathiraju, Assistant Farm Manager, Botanic Gardens, Coimbatore is granted leave on average pay for one month from 1st December 1936 preparatory to retirement.

I Circle. M. R. Ry. M. Satyanarayana, A. D. Pithapuram is granted leave for one month and 22 days with effect from 1—11—36 with permisson to suffix Xmas and new year holidays.

III Circle. M. R. Ry. C. S. Balasubramaniam, Assistant in Entomology, Bellary is granted leave on average pay without medical certificate for one month and nine days from the 14th November 1936 with permission to prefix the holiday on the 13th November and suffix the Christmas and New year holidays from the 23rd December 1936 to January 1937.

V Circle. M. R. Ry. R. Koladavelu Naicker. D. Peravurni is granted leave on average pay for 3 months from 16—10—36. M. R Ry. V. S. Narayanaswami Iyer, A. D. is granted extension of leave on average pay on medical certificate for 4 months from 24 - 10 - 36 to 23 - 2 - 37.

VI Circle. M. R. Ry. Kannapp Pillai, Assistant Farm Manager, Agricultural Research Station, Koilpatti under orders of transfer to the vii Circle is granted leave for 2 months and 5 days from 18th October 1936 with permission to suffix the Christmas and new year holidays to his leave subject to eligibility.

VII Circle. M. R. Ry. A. Ramalinga Iyer, Agricultural Demonstrator, Tiruchendur, is granted leave on average pay without medical certificate for three months from 10 - 11 - 36 or date of relief by the Agricultural Demonstrator, Srivaikuntam, who will be in additional charge of Tiruchendur sub circle until further orders.

VIII Circle. M. R. Ry. P. M. Appaswami Pillai, Asst. Agl. Demonstrator, Hosur, is granted extension of leave on medical certificate for one month and nine days from 14 - 11 - 36 with permission to suffix Christmas and New year holidays.